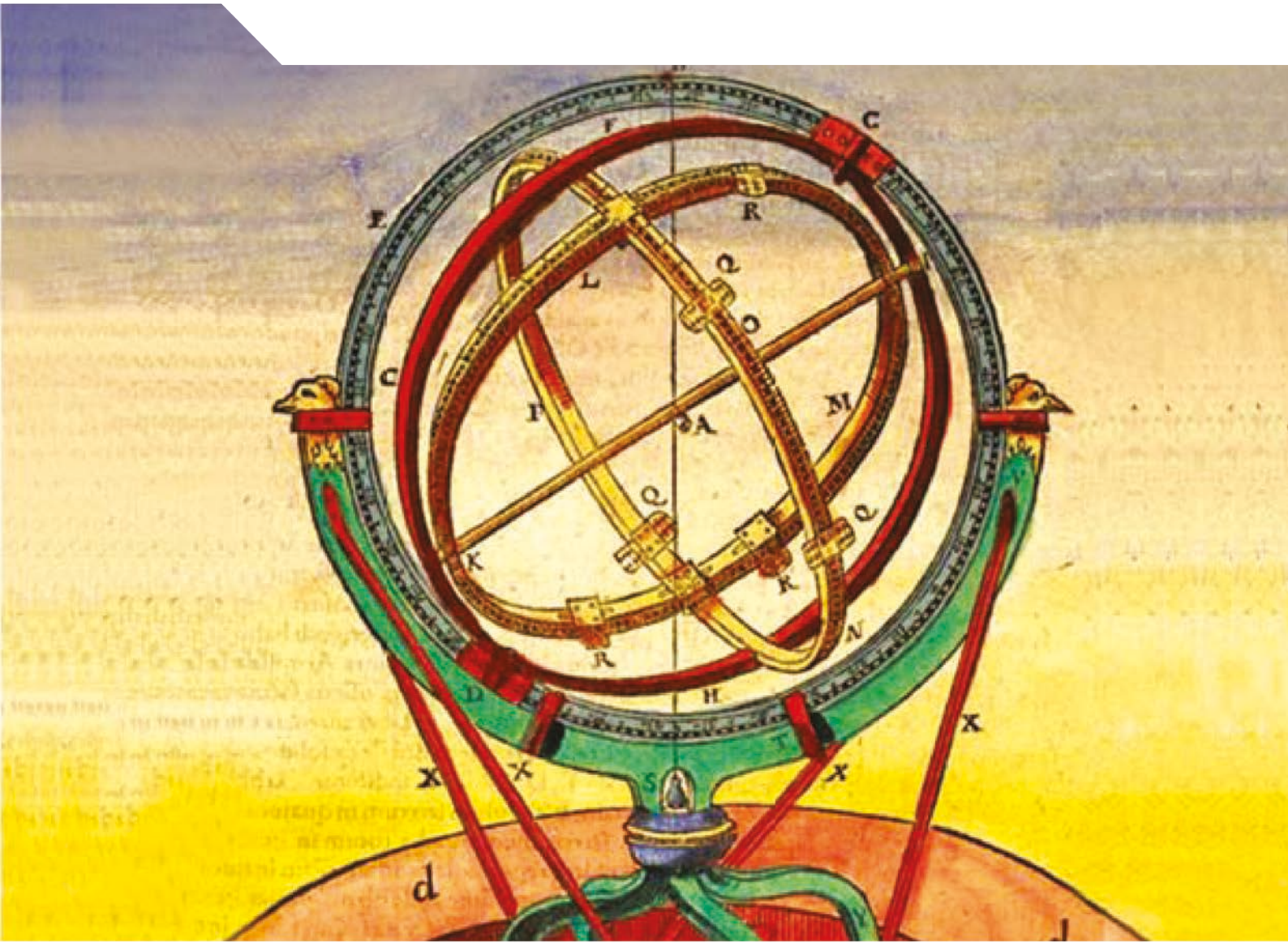
Educational Research and Innovation

Measuring Innovation in Education 2023

TOOLS AND METHODS FOR DATA-DRIVEN ACTION AND IMPROVEMENT



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Measuring Innovation in Education 2023

TOOLS AND METHODS FOR DATA-DRIVEN ACTION AND IMPROVEMENT

Edited by
Stéphan Vincent-Lancrin

OECD
BETTER POLICIES FOR BETTER LIVES

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Foreword

The digital transformation made the power of data visible to all. While it is pushing the boundaries on what data means, what data can be collected, and what their processing can do, it has also made the idea of a data-driven education a more tangible reality. While standard data collections and administrative data should support policy and practice, new kinds of data collection and data use can support all education stakeholders to make data actionable.

Most countries have an innovation policy when it comes to the business sector, consisting of providing businesses with the incentives and conditions to innovate at their level, based on their needs, expertise and capabilities. This is often a blind spot in education policy. Countries certainly have education innovation programmes, but they are usually aimed at small scale teacher professional development rather than systemic improvement. When asked which countries innovate the most in education or have the best innovation-friendly ecosystem for education stakeholders, we can have enlightened opinions, but very little data to support our claims. As a strong driver of innovation in the business sector, countries routinely collect data on research and experimental development (R&D), but here again, most countries pay little attention to their levels of investment, use and production of educational R&D.

This book provides policy makers with public tools that they can adapt to their context (or that they could use internationally) to understand better educational innovation within their education system and how they could support it. Some of the tools presented, both for educational innovation and educational R&D, are statistical in nature: they provide examples of questionnaires and methods, adapting the standard international practices in these fields to education.

Beyond policy makers, data can be useful for institutional leaders to assess the innovation culture or their establishment or to drive positive change and dialogue about a specific objective (for example equity). Examples of these types of instruments are also proposed, here again anchored in the relevant research literature.

Finally, this book proposes new approaches using big data to measure both innovation and educational research. In the first case, it shows how online discussions within education system could help identify what topics related to educational innovation are discussed, how the networks around different types of innovation are structures, and whether they vary across countries. In the second case, bibliometric information based on hundreds of millions of publication records can help map the geography of the world educational research output, identify where and when collaboration happens.

As collecting and using collected data will become easier, it is time to expand our knowledge base so as to better understand when investing in educational innovation or in educational research leads to a positive impact. This book suggests different ways of collecting meaningful information on educational innovation and educational R&D. It is now in the hands of education stakeholders to actually collect and use those data for positive change.

Andreas Schleicher

Director for Education and Skills

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Stéphan Vincent-Lancrin, Senior Analyst and Deputy Head of Division at the Organisation for Economic Co-Operation and Development (OECD) Directorate for Education and Skills, edited this book and conceptualised and led the project on “Measuring Innovation in Education” of the OECD Centre for Educational Research and Innovation (CERI).

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Executive summary

This publication proposes public tools and new methodologies that statisticians, policy makers and institution leaders could use to better understand the nature, quantity and conditions for educational innovation in their system or institution. While the measure of innovation and research is commonplace in most sectors within OECD countries, this is not the case in the education sector yet. This leaves education policy makers with little information or evidence to design, implement and improve an innovation policy in education. While some statistics are more useful at the system level to inform system-level policies, institutional leaders or local policy makers who will typically be at the forefront of driving change can also collect and use data to drive change towards specific educational goals or just to create the conditions for improvement.

Part I presents three possible approaches to measuring educational innovation and thereby collecting data that can inform action. After exploring the research literature and practice on how to measure important dimensions of the innovation process and outcomes and showing how this can be applied to education (chapter 2), three sets of model questionnaires are presented. The questionnaires are designed to help local, regional or national public authorities, school principals, or tertiary education managers, to:

- Better understand the process of innovation in education and associated activities and the main factors that influence innovation.
- Monitor changes in pedagogical and administrative practices, including the adoption of innovative practices.
- Identify differences in innovation at the primary, secondary and tertiary education levels (and possibly other sectors such as early childhood and training).
- Identify the drivers or sources of innovation in different domains and at different levels.
- Collect data that can be used to link innovation to existing evidence on educational outcomes.

The three sets of questionnaires include: a main questionnaire that covers all innovation activities (chapter 3); a short module of questions about the innovation culture of educational institutions, that could be distributed as such or included in other surveys (chapter 4); a questionnaire identifying how past or future innovation could improve equity in an educational institution (chapter 5). The first questionnaire is primarily designed to collect statistically representative data, while the primary function of the other two questionnaires is self-reflection, although they can also be used to collect representative data. Implementation suggestions are then provided (chapter 6). All questionnaires are designed as matched employer-employee questionnaires designed for school leaders, teaching staff and, when useable for self-reflection, students.

Part II explores a new methodological approach to measuring the nature and processes of innovation in education. Instead of working with statistically designed datasets, it works with “big data” that users made publicly available on the Internet, in this particular case through social media (Twitter). It identifies the nature of the discussion on educational innovation across linguistic areas (English, French and Spanish) as well as the structure of the communication networks. This approach casts new light on how educational innovation is discussed, spread and by whom in different countries and languages. While this approach

does not allow for country comparisons, it identifies some similarities and differences in the use of educational innovation across linguistic areas. For example, while all discussions were comprised of a wide range of communities, the Spanish sample showed very few signs of these communities being connected with each other, suggesting a strong internal focus on topics and circumstances that are relevant for the individual communities. In contrast, the English- and French-based samples show a strong degree of interconnectivity between the communities (chapter 7).

Part III presents different ways of measuring the expenditures, output and nature of educational research. In most sectors, public and private research and experimental development (R&D) expenditures constitute a good indicator of the intensity of product and process innovation. Thus, a key measure in innovation policy is to fund and stimulate public research, partly in alignment with governmental priorities, partly leaving researchers identify strategic research areas, generally by means of a tax policy to encourage private investment in R&D and by funding university researchers and government research agencies.

Existing official data on countries' public budget allocation to research show that, in 2020, an OECD country allocated on average 1.7% of its public research budget to education. The budget for educational research has grown in the past decade. As these official statistics cover all sectors, they are challenging to collect at the level of "socio-economic objectives" such as education, and most indicators are no longer available at that level of granularity (chapter 8).

A possible strategy for education policy makers to have reliable information to support their investment in research would be to collect their own data about how much is spent on educational research, for what purpose and by whom. A questionnaire and original survey methodology that was successfully piloted in Norway and the Netherlands is proposed, adapting traditional R&D surveys to the educational context (chapter 9).

Finally, bibliometrics is another way to measure the evolution of educational research using existing datasets. One difficulty in the case of education lies in the fact that it is both a subject of inquiry and a field of science. The report proposes a new methodology to identify and track the educational research output through a semantic approach. Beyond this methodological dimension, it shows that educational research has increased both in quantity and as a share of the general research output. While OECD countries still produce the majority of educational research, their share in the world output has decreased over the past decades. Educational research is mainly produced by researchers in the social sciences and in humanities, but in 2020 half of it was produced in other fields of science, notably the health and natural sciences. This is an example that may not be visible to traditional education stakeholders and even to educational researchers that may belong to different research communities. Despite the limitations of bibliometrics, similar approaches could easily be implemented to follow the trends in educational research and provide policy makers with useful comparative information (chapter 10).

Part I Three survey approaches to measuring innovation in education

1 Measuring innovation in education: three approaches based on the innovation survey methodology

Koen Van Lieshout, OECD

Stéphan Vincent-Lancrin, OECD

This introduction presents the purpose of this part of the publication, which includes four chapters. Its objective is to showcase how innovation in education could be measured by using a survey methodology, that is, asking some actors about the intensity and nature of innovation in their organisation. This follows a methodology that OECD countries have implemented for decades in the business sector, and more recently in the public sector and education. The different approaches proposed exemplify different methods for achieving this objective, which can be undertaken either for statistical purposes at a system level or for self-reflection at the institutional level. Those public goods are meant to be implemented or adapted by local administrators or actors.

How could administrators or institution leaders use a survey methodology to better understand how much innovation is happening in their system or institution, whether actors have different perspectives on it, and how can they approach innovation itself from different perspectives? This is what this part of this publication is about.

First, it explores the research literature and practice on how to measure important dimensions of the innovation process and outcomes and its applications to education, particularly at the level of educational institutions such as schools (chapter 2). This purpose is met through an evaluation of existing research on innovation, including relevant questionnaire surveys in education.

Second, it presents three sets of model questionnaires for measuring innovation in education (chapters 3, 4 and 5) that are based on this research as well as on the previous OECD experience in this area (OECD, 2014[1]; Vincent-Lancrin et al., 2019[2]). The questionnaires are designed to help local, regional or national public authorities, school principals, or tertiary education managers, to:

- Better understand the process of innovation in education and associated activities and the main factors that influence innovation.
- Monitor changes in pedagogical and administrative practices, including the adoption of innovative practices.
- Identify differences in innovation at the primary, secondary and tertiary education levels (and possibly other sectors such as early childhood and training).
- Identify the drivers or sources of innovation in different domains and at different levels.
- Collect data that can be used to link innovation to existing evidence on educational outcomes.

The three sets of questionnaires include: a main questionnaire that covers all innovation activities (chapter 3), a module of questions for inclusion in other surveys that collects data on the innovation culture of educational institutions (chapter 4), and a questionnaire on the use of innovation to improve equity in education (chapter 5). The first questionnaire is primarily designed to collect statistically representative data (chapter 3), while the primary function of the other two questionnaires is self-reflection (chapters 4 and 5), although they can also be used to collect representative data.

As summarised in Table 1.1 different questionnaire versions were developed for school leaders and teachers and versions of the innovation culture module and equity questionnaire were also produced for students.

Table 1.1. Summary of model questionnaires by page length

	School leaders	Teachers	Students	Chapter
Main innovation questionnaire	14	14	-	See chapter 3
Innovation culture module	5	5	3	See chapter 4
Innovation and equity questionnaire	14	14	12: tertiary students 9: secondary students	See chapter 5

None of the questionnaires have undergone cognitive testing, consisting of face-to-face interviews with a small number of diverse individuals drawn from the population of interest (for instance teachers and school leaders for the main innovation questionnaire). Cognitive testing is strongly recommended before implementing any of these questionnaires to ensure that all questions are understood by potential respondents, as intended, and that respondents can provide reasonably accurate responses. The footnote provides a link to a useful ‘how to’ guide to cognitive testing, developed by Gordon Willis (2004[3]).

Innovation is not necessarily an improvement over existing processes, goods, or services. It is possible for an innovation to make matters worse, for instance a new teaching method could reduce student

performance or make learning less pleasurable. Some of the problems caused by innovation are due to conflicting goals, for instance an innovation that successfully reduces costs could have detrimental effects on learning, or back-office innovations could increase instead of decrease the workload of educators.

Measuring innovation is primarily about measuring processes (OECD/Eurostat, 2018[4]) instead of measuring innovation outcomes, although innovation surveys can provide limited data for some types of outcomes. Nevertheless, some processes and practices are more likely to lead to better outcomes, for instance collaborating with external sources of expertise or conducting pilot tests. Collecting this data can help governments and educators to determine if best practices are in use and if improvements are needed. In addition, innovation data can be linked to external outcome data of interest, such as student academic performance or satisfaction with their learning environment, to determine if there is a significant positive or negative relationship between innovation and outcomes. However, while this can be useful as an indicator of the possible success or failure of an innovation, a comparison of different types of interventions on outcomes requires a different methodology based on policy evaluation methods that are generally unsuited to an innovation survey (OECD/Eurostat, 2018, pp. 229-237[4]). This is particularly important for pedagogical innovations or evaluating social inclusion or equity effects, where self-selection bias is likely.

References

OECD (2014), *Measuring Innovation in Education: A New Perspective*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264215696-en. [1]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [4]

Vincent-Lancrin, S., J. Urgel, S. Kar and G. Jacotin (2019), *Measuring Innovation in Education 2019: What Has Changed in the Classroom?*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264311671-en. [2]

Willis, G. (2004), *Cognitive interviewing: A tool for improving questionnaire design*, Sage publications. [3]

2 Measuring innovation through surveys: Main considerations and applications to education

Koen van Lieshout, OECD

Anthony Arundel, University of Maastricht, Netherlands

Stéphan Vincent-Lancrin, OECD

This chapter presents the research underpinnings for the survey chapters that follow. It starts with exploring existing research on measuring innovation that is relevant to the education sector, in the form of experimental surveys in the public sector and Oslo Manual guidelines. After, the chapter evaluates 13 relevant surveys on innovation or organisational change in the education sector, covering the four most relevant surveys in-depth. The last sections discuss survey methods to ensure the surveys obtain the representative data or data valuable for self-reflection and conclude.

Introduction

Technological change from new technologies such as digitalisation, genomics and artificial intelligence offer substantial economic, social, and environmental benefits as well as significant challenges to equality, governance, and social inclusion. Obtaining the benefits from technological change, while minimising the costs, requires current and future citizens to acquire skillsets that enable them to actively participate in and benefit from a changing world. For many, this could require continually learning new skills and adapting to the need to switch jobs multiple times throughout their careers. These skillsets include a variety of digital skills, but also, importantly, the "4Cs" of creativity, critical thinking, communication and collaboration.

The education sector plays a prominent role in assisting both adults and children to acquire, strengthen, and maintain digital and 4C skills. Moreover, governments are encouraging education systems to adopt digital applications for school and system management, in-class teaching, and home learning. To ensure that these changes are implemented successfully, the education sector also needs to re-skill and up-skill teachers, which requires continuing investments in the teaching profession. The goal is to increase the productivity of teachers, the efficiency and pleasure of learning for students, and the ability of students to enter the workforce after graduation. These initiatives for both students and teachers are expected to improve learning outcomes and assist societies to benefit from the digital economy.

Improving the productivity of teachers and the efficiency and pleasure of learning for students requires innovations in the administration of education and the methods of teaching and engaging students in learning. A common concern is that innovation is complex and challenging for governments (Mulgan and Albury, 2003[1]; Potts and Kastelle, 2010[2]). Innovation is new, unknown, and can entail risks, whereas governments have a statutory duty, democratic responsibility, and political mandate to deliver public services in consistent and equitable ways. Managing the tension between government duties and innovation can be difficult if the risk of innovating appears far greater than the risk of maintaining the status quo. Nor does innovation sit well with the control function of hierarchies which, while they ensure stewardship and accountability over the use of resources, can discourage risk-taking (OECD, 2017[3]). Nevertheless, research using representative surveys has found that the incidence of innovation in the public sector often exceeds that of the private sector (European Commission, 2013[4]; APSC, 2011[5]). This is partly because public sector organisations are larger than many businesses and have the resources to invest in innovation through purchasing new technologies. In addition, research has found that public sector managers are capable of innovating within risk averse environments (Kay and Goldspink, 2012[6]; Torugsa and Arundel, 2017[7]).

Over the last few decades, digital technologies have been a major driver of innovation in the education sector, but many other factors also play important roles. For example, alterations in funding or personnel, the changing needs of students or parents, or system shocks (such as the COVID-19 pandemic) can cause or require innovation. The private sector is also an important source of innovations with applications in education. A recent publication at the OECD has assessed how new technologies could assist pedagogical or organisational conditions in education (OECD, 2021[8]).

It is entirely possible, however, that specific administrative or pedagogical innovations can fail or only succeed for some types of students or have unintended consequences. Furthermore, the staff of educational institutions can lack the necessary know-how to design innovations or adapt good practices to their own circumstances. Measuring innovation processes, the extent and variety of innovations, and the outcomes of innovation, can provide governments and education practitioners such as teachers with useful knowledge on how to improve their innovation capabilities and outcomes. Relevant information on processes includes whether the organisation's management has cultivated an environment conducive to innovation, for instance through incentives for staff to participate in innovation and support for collaboration and communication within the organisation and with external partners. Information on outcomes include the effects of an innovation on different users, non-users, and on other processes and services.

The measurement of innovation in education is a necessary complement to work focused on cultivating 21st century skills, improving teaching and learning, and the use of technology in the education sector. Schools frequently innovate through introducing new processes and services. Ensuring that school leaders have timely information about these new initiatives is a key part of the feedback mechanism to improve the ability to innovate and innovation outcomes. Moreover, asking educators questions about the innovation activities of their own organisation encourages reflection on what might be necessary to achieve better outcomes.

However, there is little focus in the education sector on measuring innovation processes and identifying factors that can improve outcomes. Conversely, both governments and businesses measure innovation in the private sector. Governments in Europe and in many OECD countries outside Europe conduct innovation surveys to obtain statistically representative data on innovation expenditures, activities, and outcomes. The act of completing innovation survey questionnaires can also inform managers about the value of specific activities such as collaboration to innovation (Gault, 2018[9]). This aspect of surveys provides a 'self-reflective' function, whereby managers are required to think about the range of innovation activities within their organisation, which could also encourage them to think about how to improve these activities.

Previous OECD efforts to measure innovation in education have focused on using existing surveys to highlight possible proxies about the intensity of innovation in education. The first attempt explored two approaches: using surveys of tertiary-educated professionals that included some questions inspired by innovation surveys and using existing international surveys of educational practices to measure how they have changed over time (OECD, 2014[10]). The second attempt systematised and improved the second approach and inferred innovation from the intensity of change that could be observed in the "most important" school practices at the primary and secondary levels – while casting light on what had actually changed in terms of pedagogical and institutional practices (OECD, 2019[11]). Measuring innovation with data that were not specifically collected for that purpose comes with limitations. Should institutions or jurisdictions be able to implement surveys on innovation in education, this would be the first best option.

In order to inform model questionnaires of how to measure important dimensions of the innovation process and outcomes in education, at the level of educational institutions such as schools or jurisdictions, this chapter presents and evaluates existing research on innovation (surveys), including relevant questionnaire surveys in education. The next two sections provide an overview of previous experience with measuring innovation that is relevant to the education sector, notably commonly accepted definitions as well as factors and dimensions of innovation. In addition to recent experimental surveys of innovation in the public sector, those sections draw on the Oslo Manual guidelines for measuring innovation (OECD/Eurostat, 2018[12]). The next section evaluates 13 relevant questionnaire surveys on innovation or organisational change in the education sector, plus one survey of the private sector. Along with expert reviews, the material covered in this chapter has been used to develop several model questionnaires for measuring innovation in primary, secondary and tertiary educational establishments (chapters 3, 4, 5). The four most relevant surveys are discussed in-depth. A section discusses survey methods to ensure that the questionnaires obtain representative data or data of value to self-reflection before the conclusions.

Objectives and definitions

Measuring innovation is primarily about measuring processes (OECD/Eurostat, 2018[12]) instead of measuring innovation outcomes, although innovation surveys can provide limited data for some types of outcomes. Nevertheless, some processes and practices are more likely to lead to better outcomes, for instance collaborating with external sources of expertise or conducting pilot tests. Collecting this data can help governments and educators to determine if best practices are in use and if improvements are needed. In addition, innovation data can be linked to external outcome data of interest, such as student academic

performance or satisfaction with their learning environment, to determine if there is a significant positive or negative relationship between innovation and outcomes. However, while this can be useful as an indicator of the possible success or failure of an innovation, a comparison of different types of interventions on outcomes requires a different methodology based on policy evaluation methods that are generally unsuited to an innovation survey (OECD/Eurostat, 2018, pp. 229-237[12]). This is particularly important for pedagogical innovations or evaluating social inclusion or equity effects, where self-selection bias is likely.

Definitions

Definitions are obtained from the 4th edition of the Oslo Manual (OECD/Eurostat, 2018[12]), which includes universal definitions that apply to all sectors, including education provided by governments or businesses.

The term "innovation" can refer to the process of developing an innovation or an output, such as a specific type of innovation. To avoid confusion, this paper uses the term "innovation activities" to refer to innovation as a process, and the term "innovation" for outputs. The term "outcome" is used to refer to the effects of innovations on the innovating organisation itself (as with process innovations) or on the users of innovations (as with the users of educational services).

Innovation activities include all developmental, financial, and commercial activities undertaken by an organisation to create an innovation. The organisation of innovation activities can vary for each innovation and between institutions. An innovation can be developed through dedicated projects with an allotted budget, through ad-hoc "back of the desk" activities without a dedicated budget, or as part of regular operations to continuously improve processes or services.

The Oslo Manual's general definition of an innovation for all types of organisations (units), including educational establishments is as follows: "An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)". A product includes goods and services.

The minimum requirement for an innovation is that it must have one or more characteristics that are significantly different from the process or product that the organisation previously offered or used. The requirement for significantly different characteristics applies to product and business process innovations that an organisation develops itself and innovations that were developed by other organisations, such as a business or a different educational establishment, with little or no additional modification. One implication of the definition is that a significant difference is from the organisation's perspective. A teaching method could have been in widespread use by other educational establishments, but it is an innovation for a school that never used the method before.

Innovation is not necessarily an improvement over existing processes, goods, or services. It is possible for an innovation to make matters worse, for instance a new teaching method could reduce student performance or make learning less pleasurable. Some of the problems caused by innovation are due to conflicting goals, for instance an innovation that successfully reduces costs could have detrimental effects on learning, or back-office innovations could increase instead of decrease the workload of educators.

Definitions of products and processes are provided by the UN's System of National Accounts (SNA) and are as follows[1]:

Goods are physical or virtual objects that can be transferred from one owner to another.

Services change the psychological conditions of users and are consumed at the time of their production. Changes in the psychological condition of a person include the acquisition of education, information, advice, entertainment, or experiences. Services can be delivered through a physical interaction or digitally.

Processes are all activities, under the control of an institutional unit, that use inputs of labour, capital, goods, and services to produce outputs of goods and services.

In education, which is a service, process and service innovations are likely to be more common than goods innovations.

Educational organisations (e.g. schools, universities, training centres, education publishers) contribute to *product innovation* when they introduce new or significantly different products and services, such as new syllabi, textbooks or educational resources, or new pedagogies or educational experiences (for example e-learning or new qualifications). They contribute to *process* innovation when they change significantly their organisational processes for producing their educational goods or services. For example, they may change how teachers work together, how they group students and manage other aspects of their learning experience; they may collaborate with other entities, use new marketing and external relations methods, new forms of communication with students and parents, etc. In the case of services such as education, products and processes may also be difficult to tell apart. For example, an innovation in education delivery (a service) can also require a new delivery method via tablet computers (a good) and use new software to automatically track attendance and grades (a process) (OECD, 2014[10]; OECD, 2019[11]; Halász, 2018[13]; Halász and Ágnes, 2021[14]).

Another defining characteristic of an innovation is that it is implemented within a defined period of time, defined as the observation period. The Oslo Manual recommends that the observation period should be no shorter than one year and no longer than three years. Consequently, a new teaching method that was implemented four years before the start of the observation period would not be defined as an innovation.

Object and subject-based approaches

Three main methods are used to measure innovation: an object-based approach, a subject-based approach, and a hybrid approach that combines these two methods. The object method collects data on specific innovations (the object), while the subject method collects general data on the innovation activities of an organisation (the subject) (OECD/Eurostat, 2018, pp. 205-212[12]). Instead of using survey questionnaires, object-based methods usually identify innovations of interest through case studies, newspaper reports, innovation awards, etc. and are therefore not discussed further. Subject-based methods usually collect data via questionnaire surveys, although it is possible to collect data from websites or other sources. The hybrid method commonly collects data through a questionnaire survey that is divided into two main sections. The first ‘subject’ section uses general questions to collect data on all the organisation’s innovation activities, while a second ‘object’ section asks questions about a single, focal innovation. Respondents are asked to think about a single innovation, provide a brief written description, and answer all subsequent questions with this innovation in mind. The purpose of the object-based questions is primarily to collect data for analytical and research purposes, whereas subject-based questions are used both for this purpose and to produce indicators for benchmarking.

The inclusion of the object method within a subject-based innovation survey has two notable advantages. First, respondents can provide more accurate responses for a single innovation, particularly for expenditures in personnel time or currency units, outcomes, and some inputs such as the source of the idea for the innovation. Second, it provides a direct link between innovation activities and outcomes.

Factors that influence innovation

Education can be provided by public, private, and non-profit schools or universities, plus the education sector more broadly includes private businesses that produce educational materials such as textbooks and software and administrative and other process innovations are often sourced from or developed in collaboration with private businesses. Consequently, some of the extensive literature on innovation in the private sector is relevant to how innovation occurs in education. However, this report draws on research on innovation in the public sector, where available, for two reasons. First, all education providers are usually regulated by government and therefore face similar requirements for student performance. Second,

the sector is dominated by public or non-profit providers of education, with the latter often receiving substantial financial contributions from government. The result is that the education sector primarily functions as a public-sector provider of services, where market incentives for innovation play only a minor role (Bloch and Bugge, 2013[15]; Gault, 2012[16]).

The study of innovation within government and the public sector more broadly has attracted a growing body of empirical research, motivated in part by the increasing demand for benchmarking the efficiency and quality of public services as well as identifying the factors that contribute to desirable innovation outputs and outcomes. Several surveys have adapted the Oslo Manual guidelines for measuring innovation in the private sector to the public-sector context (APSC, 2011[5]; Arundel and Huber, 2013[17]; Bloch and Bugge, 2013[15]; OECD, 2015[18]), and recent innovation surveys have added questions that are explicitly designed for the Government sector (European Commission, 2013[4]). This shift was driven by the need to collect data to support public sector innovation policy (Arundel, Bloch and Ferguson, 2019[19]). In addition, several surveys have focused specifically on the education sector (see below, including Table 2.1).

Case studies and interviews have also been widely used to examine innovation in education, health, and social care services (Windrum and Koch, 2008[20]; Osborne and Brown, 2013[21]). This research is relevant to measurement because it identifies innovation activities and barriers that differ from those covered by the Oslo Manual for the private sector.

Environments conducive to innovation

The key foundations for innovation in the public sector can be summarised in four areas that government policies need to address to strengthen the abilities of public-sector organisations to innovate. Within each of these areas, there are policies and practices that can foster innovation.

Pro-innovation culture: Leadership needs to motivate and empower staff to explore new ideas and experiment with new approaches to their work and ensure that their staff have the knowledge and capabilities to develop, implement and evaluate innovations.

Knowledge and capabilities: Knowledge is essential to innovation and can be obtained from multiple sources within and external to the organisation. The challenge is to build the capacity to collect, identify, and apply knowledge to improve decisions about innovative solutions and to evaluate outcomes.

Innovation management: This includes the development of teams to guide innovation activities and work in partnerships across organisations and even sectors. Good management is also required to address obstacles and manage risks.

Resources and drivers: Innovation requires resources, both financial and time, and goals that can drive the innovation process.

Pro-innovation culture

New processes and services are generated by civil servants, political leaders, service users and members of the broader community, and the efforts of various professionals and stakeholders at different stages of the innovation process ensure they are developed and brought to scale. Civil servants and public employees play a key role at every stage, which means that the way in which the innovation process is managed is fundamental to successful innovation in public organisations. Public-sector staff are instrumental to implementing reforms as well as putting forward innovative ideas and contributing to their development at every stage of the innovation process (OECD, 2015[22]). Ideas for innovations often stem from middle managers or front-line staff, according to research on public-sector innovation (Borins, 2014[23]), which could support the conclusion that, “increasingly, innovation is as much a ‘bottom-up’ and ‘sideways-in’ process as a ‘top-down’ process” (Hartley, 2006[24]). Eurofound (Eurofound, 2012[25]),

moreover, posits that employee-driven innovation "depends strongly on employees contributing their knowledge, expertise, creativity and commitment to the process".

The challenge for management, therefore, is to harness the potential for creative problem-solving of their workforce, which should enable more employee-driven innovation. To this effect, managers and leaders should invest in fostering a 'pro-innovation culture' that begets the conditions needed to support employees to innovate, champion and lead employee-driven innovations, and rally the necessary resources.

Building a pro-innovation culture in a public-sector organisation requires a governance structure that permits managers to make decisions on innovation and encourage staff, at all levels, to participate in innovation activities. The trend in governance since the 1980s has moved towards giving managers greater discretionary power within the boundaries set by the political arm of government. For instance, New Public Management gave senior managers decision making power over efficiency improvements, but this has changed over time to a networked government structure that encourages a broader range of innovation activities (Torfing, 2019[26]; Crosby, 't Hart and Torfing, 2017[27]). However, governance structures can vary considerably within governments and even within government agencies.

A pro-innovation culture is defined as the behaviours and practices, shared by staff, that support innovation (OECD, 2017[3]). Relevant behaviours include open-mindedness, willingness to change, diversity of profiles, collaboration, and learning from failure. Relevant practices include involving employees in innovation decisions, providing staff with sufficient time and resources for innovation activities, training employees in innovation methods, including design thinking, co-creation, and pilot testing (European Commission, 2013[4]; Christiansen and Bunt, 2012[28]); recognising innovators through awards or incentives, and evaluating innovation outcomes.

Working with the diversity of an organisation's workforce can help to create a pro-innovation culture. A more diverse workforce could affect innovation activities by means of communication and interaction among employees, and such forms of knowledge exchange can both be stimulated and hampered by diversity (Østergaard, Timmermans and Kristinsson, 2011[29]). Employee diversity could comprise of dimensions like age, gender, nationality, and sociocultural background.

Ensuring that employees can take the time and effort to innovate and are recognised for their work via awards or promotion is a key part of creating an innovative workplace culture. Financial incentives, however, are at risk of providing perverse effects and system gaming (Amabile, 1997[30]).

Employee motivation and empowerment

Many of the behaviours to support innovation require employee motivation. While ability determines what the workforce is capable of, motivation determines what the workforce will try to do when given the opportunity. Motivation can at times even make up for an initial skill deficiency, because highly motivated employees will invest more effort into acquiring such necessary skills (Amabile, 1997[30]). Ex ante motivation levels of employees are heterogeneous, yet this motivation can also be fostered or deteriorated by the organisational environment (Mumford, 2000[31]). Various studies have corroborated that motivated employee engagement is significantly positively correlated with organisational outcomes, such as performance and innovation (OECD, 2017[3]).

Motivation can be intrinsic to the person or created by external factors. Intrinsic motivation occurs when a person obtains pleasure from an activity or its completion, or when an activity meets internal values and standards, such as community service or ethical fairness (Frey and Osterloh, 2002[32]). With extrinsic motivation, people act because of a financial or other reward that is separate from the act itself. Intrinsic motivation is much more important in fostering creativity and innovation than extrinsic motivation. Conversely, extrinsic motivation, particularly when stemming from rewards for short-term performance, may result in a narrower definition or view of the task and thus cause employees to steer clear of more innovative approaches to such tasks (Amabile, 1997[30]; Fernandez and Moldogaziev, 2012[33]).

A pro-innovation culture also needs to give employees the discretionary power or opportunity to innovate, which requires some level of autonomy (Shalley and Gilson, 2004[34]). Employees need a level of freedom in how they plan their time and approach their tasks in order to address their tasks creatively. Clear goals and expectations can frame this autonomy to provide some structure which can benefit both managers (to regulate action), and employees (to structure their time and work).

Employees, in short, require the ability, motivation and the opportunity to do well at their jobs (Boxall and Purcell, 2011[35]). A pro-innovation culture addresses the abilities and motivation of employees to innovate and provides them with the opportunities they need to put their abilities and motivation to work.

Resources and drivers

Adequate resources are essential for innovation. Sufficient time is critical, as developing an innovation requires an iterative process of evaluating alternatives, testing them, learning from the test results, and revising the innovation as necessary.

Central budget agencies often fund major innovations in response to policy initiatives, but innovations developed from staff ideas often receive little or no dedicated funding. For these, the main input is staff time. Centrally funded innovations are often given targets and goals, as well as resources for performance management and evaluation. Other resources such as skills and expertise are discussed below.

Drivers for public sector innovation include government policies and legislation (Borins, 2014[23]), for instance to digitise many government services or to improve service outcomes, Businesses and citizens can also create demand for services or regulations to improve well-being (address different forms of pollution such as noise, airborne particulates, etc.) (Agolla and Van Lill, 2016[36]).

Political and demand drivers are frequently external factors over which public sector managers have little or no influence. Conversely, some aspects of innovation demand are created internally, within the organisation. These include staff demands for process innovations that improve working conditions or process efficiency and many “bottom-up” innovations that result from interactions between service users and the front-line staff of government organisations (Andersen and Jakobsen, 2018[37]; Simmons and Brennan, 2017[38]).

Drivers are often closely linked to innovation objectives, such as plans to digitise a specified percentage of government services within a defined time period, or an educational policy to improve student outcomes.

Innovation management

Innovation management covers all activities to initiate, develop, and implement an innovation, including systems for recognising innovation opportunities, managing their development, and managing obstacles. These tasks require dynamic managerial capabilities to foresee and react effectively to internal and external challenges (Helfat and Martin, 2014[39]; Helfat, C. et al., 2007[40]).

The management of innovation activities affects the type of innovations that are undertaken, the extent to which employees are involved in and invested in innovation, and how easily knowledge about the innovation is diffused across and beyond the organisation. Good innovation management can also require assigning responsibility for an innovation or constructing a team of staff to develop an innovation. Another role for management is monitoring outcome performance.

Use of innovation teams

Innovation teams of employees with different skill sets can be created to run complex innovation projects. Their use has a significant positive effect on innovation outcomes (Arundel, Casali and Hollanders, 2015[41]) and can manage tensions due to continuing business-as-usual work at the same time as experimenting

and introducing new approaches. Innovation teams can bring together different innovation methods and skills and facilitate collaboration with external partners.

Obstacles to innovation

There are two types of obstacles to innovation. The first is common in organisations that do not innovate, that experience an obstacle as a barrier that prevents innovation from occurring. The second creates problems for innovation, but the organisation is able to solve the problem or work around it, although this can be costly in terms of time and funds or require the organisation to downgrade its goals for an innovation.

The types of innovation obstacles that affect the public sector have been examined in multiple studies, including questionnaire surveys (Cinar, Trott and Simms, 2019[42]). In a survey of over 3 000 European public sector managers from innovation organisations, the most frequently reported 'high importance' obstacles were insufficient human or financial resource, cited by 55% of managers, followed by legal requirements (38%), lack of management support (29%) and staff resistance (21%) (Arundel, Casali and Hollanders, 2015[41]).

Internal regulations or staff resistance are common obstacles (de Vries, Bekkers and Tummers, 2014[43]; Osborne and Brown, 2013[21]), that can also act as barriers to innovation. Public sector improvements through innovation can also be hampered by bureaucratic obstacles, which no longer successfully serve the purpose for which they were designed – according to several reports (European Commission, 2013[4]; Lunn, 2014[44]; OECD, 2015[22]). By applying such outdated or redundant rules rigidly and having inadequate will to change existing processes and services, the production of public value through innovation could be stifled.

Research from the Netherlands has highlighted that conservative interpretation of laws and regulations by civil servants may cause a barrier rather than the rules and regulations themselves (Kruiter et al., 2008[45]; Cels, de Jong and Nauta, 2012[46]). This could stem from a lack of imagination or factors hindering civil servants in taking initiative for more liberal interpretations. For example, the culture at the organisation may undervalue innovation or the manner in which accountability for failure is structured may discourage employees to take risks.

Several methods can reduce bureaucratic obstacles or barriers to innovation: engage stakeholders who are or will be subject to regulations to help identify solutions to hurdles at an early stage in the innovation process (OECD, 2015[22]); obtain the assistance of central innovation units who are familiar with managing regulations; and, in the longer term, use behavioural insights, either from a dedicated innovation unit or separate consultations, to embed experimentation into policy design (Lunn, 2014[44]; OECD, 2015[47]).

Risks

The risk of failure due to technical or organisational causes can create reputational or political damage and consequently senior civil servants can be reluctant to engage in ambitious innovation projects. Osborne and Brown (2011[48]) argue that this could cause innovation projects to focus on minor improvements, instead of making major changes that can offer substantially greater benefits. It may also be difficult to evaluate the payoffs from taking risks, since there is a lack of comparable quantitative metrics for outcomes (Townsend, 2013[49]).

One of the pillars to an innovative public sector is to challenge perceptions of risk (Mulgan, 2009[50]). Such perceptions are found to be responsive to change by senior management taking responsibility for failure (Potts and Kastelle, 2010[2]; Townsend, 2013[49]) to alleviate employees of such concerns and feel safe to experiment and push the envelope with riskier approaches. Other means to change perceptions are to install reward structures that are linked to the potential benefits of innovation, recognise staff successes, improve the protection of staff when innovation efforts fail, build narratives around successful risk taking, and train staff to manage risk rather than avoid it. Managers can also minimise risk through obtaining the

assistance of external experts, for instance through collaboration and co-creation with users, and developing innovations carefully (Torugsa and Arundel, 2017[7]; Kay and Goldspink, 2012[6]).

Knowledge and skills

Theories of innovation such as Kline and Rosenberg's (1986[51]) chain-link model and innovation systems theory (Freeman, 1987[52]; Lundvall, 1992[53]; Nelson, 1993[54]; OECD, 1997[55]) posit that innovation is not a linear activity, but an iterative process that draws on multiple knowledge inputs to solve a problem. Knowledge and skills can be acquired through learning from outside sources, including through collaborating on the development of an innovation, or by activities within the organisation, such as design thinking, co-creation with users, experimentation, and pilot-testing. The goal is to create value, either for the organisation itself, as with processes, or for the users of services.

External sources of knowledge and skills

Knowledge of relevance to innovation is generated, distributed, and used by multiple actors, such as firms, universities, public research institutions, public sector organisations, customers as users of goods and service innovations, and other individuals. The innovation activities of both firms and public sector organisations rely on external sources of knowledge (Chesbrough, 2003[56]; Dahlander and Gann, 2010[57]; Demircioglu and Audretsch, 2020[58]; Sørensen and Torfing, 2011[59]). Information can also be exchanged, but unless it is understood and processed to become knowledge it is not useful.

Knowledge of value for innovation activities can be obtained from external sources in many ways. It can be purchased, for instance by hiring the services of consultants or buying new technology; or acquired at little cost from reading reports or articles that describe innovations, attending conferences, or through contacts with the staff of other organisations. Employees can also be seconded to work in an academic institution or other organisation as part of a collaboration project.

Collaboration on innovation is a defining feature of how public sector organisations innovate, with up to 80% of European public agencies reporting its use (Arundel, Casali and Hollanders, 2015[41]; Bugge, Mortensen and Bloch, 2011[60]). The most frequently reported collaboration partners are other government organisations. Collaboration can reduce risks by drawing on the expertise or experience of collaboration partners with similar innovations. In this respect, collaboration can support the diffusion of good practices.

An innovative public sector organisation can also share its expertise with valuable innovations with other public sector organisations, leading to the ongoing diffusion of good ideas. The sharing of knowledge among different public sector organisations can be supported through innovation-oriented networks that connect multiple organisations that provide different types of services, for instance education and health. Such networks can support multidisciplinary perspectives, pool knowledge of different parts of an innovation process (e.g. co-creation, pilot testing and post-implementation evaluation), and integrate potential spillovers. Nodal organisations in these networks, such as the OECD Observatory of Public Sector Innovation, can share evidence, case studies, and examples of good practice that buttress the adoption and diffusion of innovation and innovation methods within the public sector as a whole (Bellefontaine, 2012[61]; Carstensen, Bason and Vibeke, 2012[62]; Puttick, Baeck and Colligan, 2014[63]; Torjman, 2012[64]). Mobility programmes can diffuse knowledge through the movement of skilled employees across different divisions, directorates, or government ministries. As a result, innovative activities in one workplace can be transferred to another, and fresh perspectives can be integrated into innovation teams on a frequent basis.

Internal knowledge and skills

Theoretically, public sector organisations could contract out all work required to develop an innovation. In practice, this is neither efficient nor good practice. Public sector staff need to fully understand the problem

before drawing up an innovation contract for an external provider, estimate costs, timelines, and unexpected contingencies; and evaluate the outcomes. All of these tasks require skills that are used for innovation, such as design thinking and co-creation with users to identify problems and solutions, and the ability to evaluate outcomes. For activities such as problem identification and co-creation of services with users, front-line staff in a public sector organisation are likely to possess considerably more relevant knowledge than external consultants. Public sector organisations can benefit from drawing on external expertise, but this is more effective if combined with internal expertise, particularly in areas where the public sector staff has hands-on knowledge.

Relevant internal knowledge is likely to be held by multiple people within a public sector organisation and consequently support for co-operation and mutual learning within the organisation is necessary. This is one of the functions of an innovation team. Several other methods can be used to support communication between different functional areas within the organisation, including the joint development of innovation strategies across functional areas, exchanging innovation ideas openly across the organisation, regular meetings of heads of functional areas to discuss innovation issue, and temporary involvement in innovation projects of personnel from different functional areas.

Public sector staff do not always need specialised skills to generate new ideas for improving work processes or services, but several types of skills are valuable for developing an idea into an innovation. OECD research identifies three types of skills for innovation (OECD, 2011[65]; Vincent-Lancrin et al., 2019[66]):

- *Technical subject-specific skills* include procedural and content knowledge associated with the type of innovation, such as computer skills for developing administrative processes using software, or expertise in learning and teaching methods for educational innovations.
- *Thinking and creativity skills include* the ability to ask the right questions and develop creative solutions and approaches to solve problems. This includes the ability to look across seemingly disparate data, cases, problems, and processes to identify common threads and connect the dots. Imagination and curiosity are drivers.
- *Behavioural and social skills include* the ability to work in partnerships, communicate, negotiate, network, and collaborate within and across organisational boundaries.

The novelty or improved characteristics of an innovation are often due to the use of new or modified technology, particularly digital technologies that support the provision of online services and back-office automation. The ability of public sector organisations to take advantage of these technologies depends on its own technological capabilities combined with its expertise in sourcing technical assistance from external sources.

A central skill set for innovation by public sector organisations concerns the nuts and bolts of how to develop an idea into an innovation. Two methodologies, developed in the private sector, can be highlighted: design thinking and co-creation. Design thinking is an iterative methodology that spans the innovation process from identifying the characteristics of a problem, developing possible solutions, producing prototypes, and conducting pilot tests of prototypes (McGann, Blomkamp and Lewis, 2018[67]). Co-creation obtains the input of the potential users of the innovation. The users of processes are civil servants, while the users of many service innovations are citizens or residents (Alves, 2013[68]; Christiansen and Bunt, 2012[28]). User input can be obtained non-interactively, for instance through surveys, or interactively, with users included in brainstorming sessions, focus groups, or one-on-one conversations with service designers (Osborne et al., 2021[69]). Public sector organisations should have access to design thinking and co-creation expertise in-house, or access to external sources of these skills, such as a government or private sector Living Lab, Innovation Lab, or Service Design Centre.

Research from the OECD and its Observatory of Public Sector Innovation finds that data and information are building blocks for innovation. Their free flow within and across public sector organisations is an

important condition for building individual and organisational capacity to innovate (OECD, 2015[22]) and is essential for generating new ideas. Public sector organisation can have a lot of data of relevance to innovation, but the ability to extract value from data requires appropriate analytic capacities (OECD, 2013[70]; Ubaldi, 2013[71]) to extract useful knowledge from vast amounts of information (Speier, Valacich and Vessey, 1999[72]).

Assessment of outcomes

A necessary skill to obtain good quality outcomes from an innovation is the capability to assess the innovation after implementation. For many government innovations, outcomes either need to be specific to the type of innovation, for instance student learning outcomes after the introduction of a new teaching method, or general outcomes that need to be measured. General outcomes rely on subjective, self-reported measures, such as an increase in efficiency or improved user satisfaction or user access to information (Bloch and Bugge, 2013[15]). These types of outcomes can be collected through online or other types of surveys of the users of service innovations. Of note, assessment provides information on whether an innovation is underperforming, meeting or exceeding expectations and identifies problems that require fixing. It is not equivalent to an evaluation that compares the efficacy of different methods of providing a service, such as different teaching methods.

Summary of the innovation process in the public sector

Innovation often occurs through several stages, although one or more of these stages could be skipped, depending on the innovation. The following descriptions outline the innovation process for substantial innovations that contain a high level of novelty. Each of these stages is more likely to succeed given a pro-innovation culture, sufficient resources, competent innovation management, and appropriate knowledge and skills.

Identifying problems. Understanding the nature and characteristics of a problem is a first step towards triggering innovative ideas to respond to it. Public sector organisations often lack the capacity to identify risks and opportunities coming from their environment and to effectively capture and interpret demand from the users of their services.

Generating ideas. Ideas that fuel innovation can be generated from the bottom up by civil servants in the front-line or initiated by executive leadership. Supporting the creation of ideas often involves incentives and rewards, creating opportunities to share experiences, and support for mobility so that civil servants can gain a broad understanding of issues and the tools to respond to them. For many public sector leaders, the rewards on offer from successful innovation are low, even if the innovation could create huge gains for the public sector and citizens, while the impact of failure can be significantly higher. This can be a major obstacle to innovation.

Developing proposals. Proof of concepts, pilot testing and trials are important steps towards translating ideas into workable projects with potential for implementation. This means creating space for public sector organisations to experiment and try new things. Innovation, by definition, entails novelty and therefore requires organisations to accept a certain level of uncertainty and transform it into manageable risk. However, the very nature of the public sector's role, with its statutory and moral responsibilities to ensure the basic safety and welfare of its citizens and be accountable for the use of public funds, means that any practice that can pose risks to meeting these responsibilities must be viewed with caution. Supporting this phase involves developing tools to better navigate uncertainty and creating the conditions for experimentation.

Implementing projects. Financial rules and controls can impede the investments needed to bring a project to scale. Budgeting can stimulate innovation through financial incentives, promoting greater flexibility, aligning budgeting and investment frameworks to scale up innovation and diffuse its benefits through the

system, and promoting methodologies to ensure successful outcomes. Innovation is also likely to emerge from interactions between different groups, so appropriate frameworks are needed to allow these interactions to happen. Government organisations need opportunities to think about how their interventions interact with those of other groups, and how they can collaborate more effectively to solve common challenges.

Evaluating projects. Innovative projects need to be monitored and evaluated to determine whether they are resolving the problems they are trying to address. Evaluating innovative projects can be a non-linear process – for example fast iteration allows assessments to be conducted during development phases. Yet few countries have developed systematic approaches to evaluating the success of innovative projects. Countries' experiences suggest that information from project data and social media could be used to evaluate the effectiveness of a project and assess whether it should be iterated, scaled up, or cancelled. Innovation requires evidence, but often at a faster and more agile pace than the traditional policy cycle.

Diffusing lessons. Sharing ideas and experiences are a constituent part of the innovation process and allow successful approaches to be replicated in different contexts. Understanding what went wrong is a powerful source of learning, given the level of risk inherent in innovative projects. At the same time, political and media scrutiny can reduce tolerance for failure, making the uncertainty and risk of innovation seem unduly expensive for the public sector. These factors may create the perception that the public sector is risk averse, but internal learning can reduce risk and uncertainty by pooling experience and results.

Innovation in education

This section zeroes in on innovation in education, one of the largest public sectors in most OECD countries. The education sector poses various opportunities for further innovation. Examples include changes in curricula, new or improved pedagogies in traditional subjects, changes in how learning is assessed (e.g. to measure a broader skillset), and new delivery methods for education, such as online learning. As in other sectors, innovations in education can drive productivity and welfare gains in society. On average, countries spend 6% of their national income on educational institutions. However, despite progress in some countries, not all education systems have taken advantage of opportunities to innovate to improve learning outcomes, enhance equity and equality, improve efficiency, and adapt to societal needs (OECD, 2019[11]).

In many countries, the awareness that a co-ordinated innovation policy for education could be beneficial is just emerging. Yet, contrary to common belief, there is a fair level of innovation in education, both relative to other sectors of society and in absolute terms. While education is below average in terms of the speed of adoption of innovations, 58% of tertiary-educated professionals in education hold a highly innovative job, that is, a job contributing to the innovation process, slightly above the 55% average in the economy (OECD, 2013[73]; 2014[10]). Within education, higher education is the most innovative sub-sector, but examples of innovation exist at all levels. The COVID-19 pandemic has also clearly shown that in some specific circumstances, education systems could innovate at a very fast pace (Vincent-Lancrin, Cobo Romaní and Reimers, 2022[74]; Vincent-Lancrin, 2022[75]). However, a good level of innovation does not necessarily imply that the education sector has a strong innovation ecosystem. Co-ordination of the different levers of innovation policy is often lacking, and the knowledge generated by past innovative pilots or experiments is not always shared and used in a cumulative way (OECD, 2013[73]; 2014[10]).

Teaching innovation

The education sector also plays a role in equipping people with the skills required to innovate, such as creative and critical thinking and social skills. Education systems increasingly include these skills in their educational objectives, but there is no evidence that they are systematically developed or evaluated. Nevertheless, several observations are relevant here:

- A broad curriculum exposes students to different knowledge content and ways of thinking. This could directly contribute to innovation by enhancing the ability to make connections between different bodies of knowledge.
- Revisiting pedagogies in traditional subjects could be valuable. For example, in mathematics education, metacognitive pedagogies that integrate an explicit reflection about students' learning and thinking, generally by using self-questioning, have been shown to lead to better learning outcomes. Not only do students improve their mathematical reasoning, but they also develop stronger skills for solving complex, unfamiliar and non-routine problems (Mevarech and Kramarski, 2014[76]). Metacognitive pedagogies are also effective in disciplines other than mathematics.
- While countries have changed curricula to broaden the skills that they want students to acquire, many of these skills are not assessed at either the school or system level. The development of new tools to assess such skills, or at least to ensure that teachers pay explicit attention to them, is critical to ensuring that students acquire skills used in innovation (OECD, 2014[77]; Lucas, Claxton and Spencer, 2013[78]; Vincent-Lancrin et al., 2019[66]).

Metacognitive pedagogies are also effective in higher education, even though their effects tend to be smaller than in school education (Mevarech and Kramarski, 2014[76]). Collaborative learning, problem-based learning, game-based learning, real time formative assessment, and the use of online laboratories have been shown to improve students' understanding, reasoning and creativity in science education (Kärkkäinen and Vincent-Lancrin, 2013[79]). This suggests that tertiary education institutions could enhance innovation-related skills through a variety of pedagogical models.

Policies to support innovation in education

There are four policy areas that are relevant to supporting innovation in education (Vincent-Lancrin, 2017[80]).

First, the education regulatory framework needs to be conducive to innovation. For example, curriculum and assessment policies have an impact on the scope for innovation, and most countries have checks and balances to ensure that grass-roots innovation is possible, but controlled (Kärkkäinen, 2012[81]). As in other sectors, quasi-markets have been used with the objective to foster innovation, and they have been found to help diffuse a variety of alternative models of schooling; however, they do not seem to lead to the emergence of new ones (Lubienski, 2009[82]). Access to finance for innovation, dissemination strategies and staff development policies are also key elements of this regulatory framework.

Second, policies to invest in R&D can support innovation. Given the significance of the sector, public spending on educational research is likely to be below what is needed. In 2012, research on education was the least funded of all socio-economic objectives for which information is available (Foray and Raffo, 2012[83]). In addition, there is often a lack of incentives for companies that produce educational resources and devices to invest in R&D, even though there has been a rise in specialised and innovative educational companies (Foray and Raffo, 2012[83]; OECD, 2016[84]).

Third, policies need to support forms of work organisation that support individual, organisational and sectoral learning of relevance to innovation. The role of learning organisations and professional learning communities is often highlighted, as is the importance of leadership (OECD, 2013[85]).

Fourth, the use of appropriate technologies, notably information and communication technology ICT, can be supported by policy, which has many applications in the education sector. Technology can also be used to transform and enhance pedagogy (Kärkkäinen and Vincent-Lancrin, 2013[79]; OECD, 2021[8]) or modify how education is delivered to students, for example through open educational resources or online courses. Technology can also transform education through data-driven innovation, which is increasingly facilitated by the establishment of administrative longitudinal information systems that follow students throughout their school and university years (González-Sancho and Vincent-Lancrin, 2016[86]).

A few countries already have an innovation policy for education. Italy has developed digital plans for education (Avvisati et al., 2013[87]). France has a chapter on innovation in its education law. The United States has had several programmes to support innovation in education at the federal level, following the model of the Education Innovation and Research (EIR) Program (powercy i3) of the US Department of Education. What is still missing in countries is a holistic and explicit strategy to create an innovation-friendly ecosystem for the education sector.

Measuring innovation in education: a review of existing survey tools

One aspect that is missing for this ecosystem to emerge are measures of innovation that could guide policy makers in their innovation support. This section evaluates 12 survey instruments that used questionnaires to measure innovation in education, plus one survey of the private sector on work climate (included because of its relevance to measuring a pro-innovation culture). The surveys differ by the part of the education sector covered (primary, secondary, tertiary), region (local, national, or international) and purpose. After a review of each survey and its relevance to innovation in the education sector, we discuss four of them in depth.

Overview

The survey name, source, and relevance to innovation in education are summarised in Table 2.1. These surveys are from several sources, including governmental, academic, private sector, and non-governmental organisations. Most focus on digitalisation rather than innovation on a whole.

Table 2.1. Overview of 13 surveys of relevance to innovation in education

Survey	Meaning of survey acronym	Source	Relevance to innovation in education
SELFIE Primary, secondary and vocational education surveys	Self-reflection on Effective Learning by Fostering the use of Innovative Educational technologies	European Commission (European Commission, 2023[88])	Focus on the views of students, teachers, and school leaders on how technology is used in their school.
Innova Organisation	-	The Higher Education and Innovation Research Group of the Institute of Education of ELTE University, Budapest ((Halász, 2017[89])	Innovation in the Hungarian education system on an individual and organisational level.
Innova Individual	-		
Managerial and service innovation surveys for higher education	-	LH Martin Institute, Melbourne University (Arundel et al., 2016[90])	Managerial and service innovations in 39 Australian and 6 New Zealand universities.
KEYS: Assessing the Climate for Creativity	-	Teresa Amabile and Center for Creative Leadership (Amabile et al., 1996[91]; Amabile, Burnside and Gryskiewicz, 1995[92])	Work climate in work groups or organisations. It identifies the necessary conditions for innovation to occur.
HATIC (Herramienta de autoevaluación de la competencia digital)	Self-assessment tool digital competence	Junta of Castile and Léon, Spain (Junta Castilla y Léon, n.d.[93])	Teacher perceptions of their use of IT in education. Though IT is only one dimension of innovation, the questions help to assess teacher approaches to new ways of teaching and learning.
LIKA	Learning, Information, Communication and Administration	Swedish Knowledge Foundation. Partners are the Royal Institute of Technology (KTH), Swedish School of Sport and Health Sciences (GIH), Royal College of Music in Stockholm (KMH), and Stockholm University (SU). (Fors et al., 2007[94])	Teacher activities, school stimulation of innovation and support to implementing and evaluating new approaches, primarily those involving digitisation.

Survey	Meaning of survey acronym	Source	Relevance to innovation in education
OPEKA	-	Finnish National Agency for Education, Association of Finnish Municipalities, Tampere Research Centre for Information and Media (TRIM)	Teacher digital competences and perceptions of ICT use at school.
DigiPeegel		Estonian Information Technology Foundation for Education and Tallinn University	Digital innovativeness of a school for learning, change management and digital infrastructure.
eLEMER		Hungarian Institute for Educational Research and Development	Four targets of innovation in education: learners and learning, teachers and teaching, management, and infrastructure.
NAACE self-review framework (SRF)		The Education Technology Association	Leadership and vision, teaching and learning with technology, assessment of digital capability, digital safeguarding, professional development, and resources and technology.
Higher Education Innovate (HEInnovate)		European Commission, DG Education and Culture and the OECD LEED Forum, and supported by a panel of six independent experts	Leadership, organisation, and digital transformation. Focus on collaboration and entrepreneurship in higher education.
Edu Week RC		Education Week Research Center	Perspectives of educators with first-hand experience with innovation in schools and districts, their varying professional roles, and the socio-economic characteristics of their schools and districts.
Mentep survey		Mentoring Technology-Enhanced Pedagogy, created by European Network and Erasmus +	Teacher competences in digital pedagogies, digital communication and collaboration, and digital safety.

Table 2.2 summarises the relevance of the design of each survey questionnaire to innovation in education. All questionnaires are relevant to self-reflection by the respondent. The following factors are evaluated:

1. General/focused: Questions cover all innovation activities (General), or focused on a specific area of innovation (Focused, usually on digitalisation);
2. Innovation activities: Includes questions on innovation activities;
3. Personal characteristics: Includes questions about the characteristics of the respondent or employees;
4. Innovation capacity: Assesses the capacity of the organisation to innovate/digitise;
5. Learning/teaching: Includes questions on teaching and learning and relevant innovations.

Table 2.2. Topics covered by surveys on innovation in education

Survey	General/ focused	Innovation activities	Personal Characteristics	Innovation Capacity	Learning/ teaching
SELFIE[1]	Digitalisation	Yes	No	Yes	Yes
Innova Org	General	Yes	No	Yes	Yes
Innova Ind	General	Yes	Yes	Yes	Yes
AU-NZ Univ.	General	Yes	No	Yes	No
KEYS[2]	General	Yes	No	Yes	No
HATIC	Digitalisation	Yes	No	Yes	Yes
LIKA	Digitalisation	Yes	Yes	Yes	Yes
OPEKA	Digitalisation	No	No	Yes	Yes
DigiPeegel	Digitalisation	Yes	No	Yes	Yes
Elemer	Digitalisation	Yes	No	Yes	Yes

Survey	General/ focused	Innovation activities	Personal Characteristics	Innovation Capacity	Learning/ teaching
NAACE SRF	Digitalisation	Yes	No	Yes	Yes
HEInnovate	General	Yes	No	Yes	No
Edu Week RC	General	Yes	Yes	Yes	No
Mentep	Digitalisation	No	Yes	No	Yes

Note 1: Includes all three SELFIE surveys (primary, secondary and vocational education).
Note 2: Only covers the private sector.

The main insight from this overview is that 8 (or 62%) of the 13 surveys on innovation in the education sector are limited to digitalisation, with only five (including two slightly different INNOVA surveys) addressing innovation in a more general way.

A large majority of surveys contains questions on innovation activities though. These include incentives, the type of employees involved in innovation, collaboration, evaluation, etc. Fewer (4, or 31%) collect data on the personal characteristics of respondents or employees, which suggests either more limited attention to workforce skills and attitudes, or the influence of privacy or ethics approval in limiting the collection of personal data. Almost all tools ask participants about the organisation's capacity for innovation, whether it concerns financial resources, digital technology, etc. The teaching and learning component is only included when the questionnaire focuses on providing education (10 out of 13).

Table 2.3 highlights that most of the questionnaires ask about a pro-innovation culture and governance, implementation, and evaluation. The least frequent topics are data and innovation management. Interestingly, many of the surveys that cover employee skills do not collect data on the creation and diffusion of knowledge, and vice versa. In terms of the surveys, LIKA, DigiPeegel, Innova Individual and NAACE SRF cover the most factors.

Table 2.3. Survey coverage of innovation conditions and activities

Survey[2]	Skills	Create/diffuse knowledge	Governance Implementation and Evaluation	Data management	Innovation Management	Rules and processes	Innovation culture	Tech use
SELFIE		X	X			X	X	X
Innova Org		X	X		X	X	X	
Innova Ind	X	X	X		X	X	X	
AU-NZ Univ.		X	X		X	X	X	
KEYS							X	
AGATIC	X			X		X		X
LIKA	X		X	X	X	X	X	X
OPEKA	X							X
DigiPeegel		X	X	X	X	X	X	X
Elemer	X	X	X				X	X
NAACE SRF	X		X	X		X	X	X
HEInnovate	X	X	X		X		X	
Edu Week RC			X				X	
Mentep	X			X			X	
	8	7	10	5	6	8	12	7

Question types

There are also differences across the surveys in the response categories for questions, which can influence accuracy and how the results can be used. Scenarios and open questions, for example, can provide details and information that are missed in a closed question[3], but are difficult to turn into indicators. Binary (yes/no) response categories and ordinal importance categories (Likert scales) can be used to construct indicators, but give less information. Multiple choice questions ask the respondent to select one option out of several options. List questions are similar to binary questions, but do not provide a 'yes or no' option. Instead, they ask respondents to tick all listed options that apply. Table 2.4 gives an overview of which types of questions are asked in each survey. The most frequently used question types are multiple choice, lists, and scenarios. Most questionnaires use several types of questions, with the Australia and New Zealand university survey using all types except for scenarios.

Table 2.4. Question types included in surveys on innovation in education

Survey	Open	Scenarios	Y/N	Likert	Multiple choice	List
SELFIE	X			X		
Innova Org					X	X
Innova Ind			X		X	X
AU NZ Universities	X		X	X	X	X
KEYS					X	
AGATIC			X			
LIKA					X	
OPEKA	X	X		X		
DigiPeegel		X				
eLEMER					X	
NAACE SRF		X				
HEInnovate			X			X
Edu Week RC		X		X	X	X
Mentep		X				
	3	5	4	4	7	5

Summary

The analysis of questionnaires on innovation in the education sector highlights a variety of topics and question types. The majority cover digitalisation and factors that are part of a pro-innovation culture. The latter could be commonly covered because of widespread concerns that bureaucratic conditions hinder innovation in the public sector. Most surveys use more than one question type, which could reflect an interest in avoiding common method bias[4].

Details on four questionnaire surveys

This section provides an in-depth discussion of four surveys on innovation in the education sector. Two surveys use multiple questionnaires: SELFIE uses customised questionnaires for different types of schools and respondents, and Innova includes organisation-level and employee-level questionnaires. This fact, alongside their broad coverage of innovation factors (only missing data management) and differing question types, makes them relevant candidates for further analysis. In addition, the KEYS survey is also evaluated in detail because it covers the work environment and is applicable to both public and private sector settings and can thus be relevant to educational institutions. Lastly, Edu Week RC is selected for further analysis because it focuses on inequality.

SELFIE

SELFIE, an initiative by the European Commission, is a self-reflection questionnaire that anonymously gathers the views of students, teachers, and school leaders on how technology is used in their primary, secondary, or vocational school. The questionnaire was developed in co-operation with schools, education ministries and research institutions across Europe. The survey covers leadership, infrastructure, teacher training, and students' digital competencies. The tool is specific to the education sector and is largely focused on publicly funded schools. It is a reasonably long survey, featuring 72 distinct items.

Each participating school receives a tailor-made, interactive report which provides both in-depth data and quick insights into the school's strengths and weaknesses and areas needing improvement. The results for specific schools are not shared unless the school leadership chooses to do so. Participation in the survey is relatively high in the European Union, with several countries, such as Spain, moving towards representative samples.

The questionnaire covers leadership, infrastructure and equipment, continuing professional development (availability and accessibility, plus experience with it), teaching and learning (teacher digital competence and practices), assessment practices, student digital competence, and personal characteristics. Given the self-reflective nature of the questionnaire, many of the questions are statements that are answered with a 5-point Likert scale (from "strongly disagree" to "strongly agree"), and a "not applicable" option. The statements focus on the presence of specific processes or assets. There is little focus on how processes or assets are implemented or used, and whether they are deemed sufficient by the teachers and students. Several questions are optional, such that schools can adapt the "standard" survey to fit their needs. Moreover, a limited number of questions of particular interest can be added to the survey in the design phase.

Although all versions of the survey cover most topic areas, different questions are used for school leaders, teachers and students and for primary, secondary, and vocational schools. Statements about school practices are consistent for school leaders and teachers, but questions on support for teachers are reworded to match the reflective nature of the tool. Several questions are only asked of teachers, such as questions about their confidence in using digital technologies in several areas, and the percentage of teaching in the last three months that used digital technologies in class. Questions for students, on the other hand, differ significantly from those for teachers and school leaders and differ for primary school and secondary/vocational students.

The disadvantages of SELFIE are lack of specificity in most of the questions. For example, the section on continuing professional development does not collect information on if or how often teachers attend, whether the opportunities provided are used, and whether it is of good quality and provides sufficient training. Moreover, there is only one question on students in need of special support. In respect to innovation factors, SELFIE does not cover skills or innovation management.

There are several advantages to innovation measurement of the SELFIE design, including covering a broad range of topics and using questions that are appropriate for different groups. There is also a lot of interest from schools to participate, likely aided by the dashboard function, anonymous participation, and non-public results. In terms of factors related to innovation, SELFIE is particularly strong on the application of technology and work organisation, with reasonably good coverage as well on governance and implementation, knowledge creation and diffusion, and rules and processes.

The SELFIE survey also points to the need to customise surveys on innovation in the education sector to ensure that questions are appropriate for different types of schools, students (primary or older) and between school leaders and teachers. It also provides a clear emphasis on implementing a survey to nurture stakeholders' discussion (and hopefully improvement initiatives).

Innova

The Innova survey covers the national education sector in Hungary and was developed by The Higher Education and Innovation Research Group of the Institute of Education of ELTE University, Budapest (Halász, 2018[13]; Halász and Ágnes, 2021[14]). It targets teachers and school leaders, with an individual-level survey for the former and an organisational survey for the latter. Hence, the tool has two separate versions for organisations and individuals. The survey is longer than the SELFIE tool, with 37 and 34 questions in the individual and organisational versions respectively (160 and 146 items).

The organisational questionnaire covers the innovation environment, innovation practices and activities, the effectiveness of the organisation, and includes a section on a single innovation. The survey includes questions about the specific nature of the organisation, for example, who provides maintenance, the size of the school, whether it is public or private, has a special education focus, and what share of the organisation participates in various staff activities. These questions provide an impression of the ability of the organisation to adapt to various innovations. The questionnaire covers innovation outcomes, including increased effectiveness, whether innovations are permanent, tested elsewhere, and whether knowledge about innovation has been shared.

Other questions cover participation in development programmes (funding, courses, etc.), the organisational work culture, and organisational performance in various areas. Moreover, there are questions about organisational challenges, environmental influences, performance relative to peers, and changes in the organisation's effectiveness over the last 10 years.

The questions on a single innovation ask when it was created, how, and if relevant, why it was discontinued There are also questions about how much the innovation differs from previous practice, its level of success, and which areas or processes it affects through questions on what the innovation is, for example a method or tool concerning planning and implementation of lessons, improving competences and abilities of students, or special education and the education of disadvantaged children.

The individual-level questionnaire includes questions on innovation practices and activities, and questions about a single selected innovation. It differs in several respects from the organisational version. For instance, it includes questions about the respondent's experience, age, foreign language skills, education level, gender, years of experience in education, and whether the respondent belongs to an internal community or professional organisation. Other questions cover the nature of innovations, potential collaborators, the organisational culture, and obstacles to improvement or success. The section on a selected innovation largely covers the same topics as the organisational survey.

The Innova questionnaires strike a balance between a questionnaire applicable to school leaders and to employees, providing complementary perspectives on innovation. Although meant for the Hungarian context, the questionnaires are applicable to other contexts, except for some questions on networks and collaboration. The questionnaire covers innovation practices on a general level and delves into a single innovation in-depth. The instrument places a strong emphasis on governance and implementation, as well as on innovation management. There are few questions on the organisation's capacity to innovate, skills, and incentives for employees to innovate, despite the separate organisational questionnaire. Finally, the questionnaire does not collect specific information of relevance to digital innovations. The questionnaire is very long and at times repetitive. This has the advantage of collecting a lot of information but could also be discourage respondents to answer. This remains a good example to draw on to design questionnaires on innovation in education.

The KEYS survey

KEYS, developed by Teresa Amabile and colleagues, surveys the climate for innovation in private sector work groups or organisations, but many of the questions are also applicable to the public sector (Amabile, Burnside and Gryskiewicz, 1995[95]; Amabile, 1997[30]). The questionnaire aims to distinguish corporate

work environments that produce better results from innovation from others, in both technical and non-technical work.

KEYS was designed to help managers gain a clear picture of the climate for innovation within a work group or organisation. The questionnaire measures creativity within the organisation, support for new ideas, the ability to innovate and take risks, and three aspects of the work climate: management practices, organisational motivation, and resources and work pressure. It has 78 items on Likert response scales. The innovation climate greatly influences an employee's ability to be creative. Work environments that produce highly creative projects and are seen as innovative are generally given higher ratings on KEYS dimensions.

There is a strong focus on employee perceptions. For example, the questionnaire asks if employees can decide what work to do and how to do it, if they feel a sense of control over their work, if their work is challenging, and if they feel that they do important work. Regarding managers, questions ask if the boss is a good work role model, sets goals appropriately, supports the work group, values individual contributions, and shows confidence in the work group. Workload pressure is covered through questions on the absence of extreme time pressures, unrealistic expectation for productivity, and distractions from creative work. Questions on the employee's work group address the presence of diverse skillsets, good communication, openness to new ideas, constructive challenges to each other's work, trust and helpfulness towards each other, and commitment to the work. Questions on the organisational context cover the organisational culture and impediments for creativity, such as harsh criticism of new ideas, destructive internal competition, an avoidance of risk, and an overemphasis on the status quo. Questions on resources cover funding, materials, facilities, and information. Lastly, several questions ask about the amount of creativity that is called for at work and whether people believe they produce creative work.

The KEYS questionnaire is relatively short and all questions are in the same format, making the questionnaire reasonably easy to fill out. The different sections can operate independently and thus could be used separately, though this could require different scales. The questions obtain the opinions and perceptions of employees on their work environment, a broad range of motivational influences, and the quality of interactions between employees and management and within work teams. These add new dimension to the SELFIE and Innova surveys. However, the KEYS questionnaire does not cover many other influences on innovation or innovation activities. Lastly, given the focus on employees, the questionnaire is not designed to glean information from school leaders or students.

Education Week Research Center

The Education Week Research Center (EWRC) survey is a nationally representative online survey of nearly 500 K-12 teachers, principals, and school district leaders in the United States. The questionnaire obtains the perspectives of educators on innovation in education and provides results by professional roles and the socio-economic characteristics of schools and districts.

The questionnaire is considerably shorter than the others, at 17 items. The first set of questions cover the future priority of innovation, the extent of innovation in the past, and how often the school or district currently innovates. Other questions ask about the respondent's risk-seeking behaviour regarding adopting innovations, the factors that drive efforts to innovate, different sources of pressure to innovate, challenges encountered in the innovation process, the role of school leaders, the necessary supports for successful innovation, innovation priorities, and general questions on the respondent's experience and socio-economic characteristics of the district. The questionnaire focuses on the pressures and challenges experienced in the innovation process.

The questionnaire has a similar focus as Innova Organisation, yet is approximately 10 percent of the length of Innova, trading lower completion time costs of respondents against the depth of information gathered. The short length could be an advantage for local administrators who want to get a quick overview of

innovation in their schools. The disadvantages are mostly due to its short length, which limits depth. The questionnaire therefore has limited capacity to support self-reflection.

Summary

Several key observations emerge from the review of the four key surveys.

First, the approaches to the questions differ. For example, SELFIE evaluates the perceptions of students, teachers, and school leaders, and is the only survey to cover all three, while also being adapted to different school levels. The questions in SELFIE are focused on the presence of various factors and not on their quality or necessity. Conversely, Innova has different versions for teachers and school leaders and is very comprehensive, requiring a very long questionnaire. The focus is on the factors that influence innovation processes.

Second, the various strengths of these four questionnaires complement each other, providing material for the design of a new questionnaire. For example, the KEYS questionnaire covers perceptions of the work environment, skills, and performance, the EWRC focuses on general information questions, and Innova provides many examples of questions on innovation processes. It is notable that the coverage of general information differs between all surveys, which emphasises the need to assess whether general information should be similar across different contexts or not.

Third, two of the four surveys (SELFIE and Innova) provide examples for how to orient questions to specific groups, including school leaders, teachers, and different levels of students.

Fourth, a single survey, due to length limitations, cannot cover all topics of interest. For example, none of these four questionnaires cover data management, which can be an important factor for supporting digital innovations and probably other types of innovations. Only one of the questionnaires covers skills and only one covers technology use. There are unavoidable trade-offs in selecting topics and questions, and the level of depth that questions can pursue. Decisions on what to cover depends on the intended users of the results and the targeted respondents.

The analysis and models provided by all these surveys provides a strong inspiration and basis to develop model questionnaires. The three model questionnaires developed in this report are presented in the subsequent chapters (chapters 3, 4, 5), after their scope, purpose, and reasons for including specific questions is introduced. As the surveys presented above, they showcase different possible methods to use questionnaires, trying to combine self-reflection as well as possible statistical uses, short and more lengthy questionnaires, as well as general and more specific targets (with questionnaires focusing on innovation climate and on innovation for equity).

Conclusions

Meeting new and existing challenges in education requires innovation to improve teaching and learning outcomes, administration processes, and the well-being of students and staff. An evaluation of whether educational institutions have the capabilities to innovate and if these capabilities lead to desired outcomes requires data on the factors that support innovation. These include a pro-innovation culture, sufficient resources, appropriate innovation management, and the necessary knowledge and skills.

Drawing on the literature on innovation in the private and public sector, we identified the factors that are important for innovation, and then reviewed existing surveys of innovation in the education sector. Both sources of information, plus advice and comments from external experts, were used to develop three model questionnaires for measuring innovation in the education sector that are presented in this part of the report: a general questionnaire that covers all innovation activities (chapter 3), a module of questions for inclusion

in other surveys that collects data on the innovation culture of educational institutions (chapter 4), and a questionnaire on the use of innovation to improve equity in education (chapter 5). Each questionnaire is provided in two or more versions, suitable for school leaders, teachers, or students.

The general innovation questionnaire is designed to collect statistical information that can be used to build a profile of innovation capabilities within an education system (or an educational institution) or for comparison across several educational systems (or institutions). In addition, the general innovation questionnaire and the other two more subject-specific questionnaires are of value for self-reflection, where the questions inspire respondents to think deeply about how innovation occurs in their institution and what might be required to improve innovation capabilities or outcomes.

The questionnaires are designed for use by school leaders (principals, deans, rectors, etc.) or government departments at multiple levels (regional or district) that are interested in collecting representative data on innovation at a single educational institution or for all institutions in a defined region. Since some of these potential users may lack expertise in how to implement a survey, chapter 6 provides guidelines for a school principal or district leader on what is required to implement a questionnaire survey as well as links to other 'how to' resources for surveys.

References

Agolla, J. and J. Van Lill (2016), "An empirical investigation into innovation drivers and barriers in public sector organisations", *International Journal of Innovation Science*, Vol. 8/4, pp. 404-422, https://doi.org/10.1108/ijis-06-2016-0006. [36]

Alves, H. (2013), "Co-creation and innovation in public services", *The Service Industries Journal*, Vol. 33/7-8, pp. 671-682, https://doi.org/10.1080/02642069.2013.740468. [68]

Amabile, T. (1997), "Motivating Creativity in Organizations: On Doing What You Love and Loving What You Do", *California Management Review*, Vol. 40/1, pp. 39-58, https://doi.org/10.2307/41165921. [30]

Amabile, T., R. Burnside and S. Gryskiewicz (1995), *User's Guide for KEYS: Assessing the Climate for Creativity*, Center for Creative Leadership. [92]

Amabile, T., R. Burnside and S. Gryskiewicz (1995), *User's manual for KEYS, assessing the climate for creativity : a survey from the Center for Creative Leadership*, Center for Creative Leadership. [95]

Amabile, T., R. Conti, H. Coon, J. Lazenby and M. Herron (1996), "Assessing the work environment for creativity", *Academy of Management Journal*, Vol. 39/5, pp. 1154-1184, https://doi.org/10.2307/256995. [91]

Andersen, S. and M. Jakobsen (2018), "Political Pressure, Conformity Pressure, and Performance Information as Drivers of Public Sector Innovation Adoption", *International Public Management Journal*, Vol. 21/2, pp. 213-242, https://doi.org/10.1080/10967494.2018.1425227. [37]

APSC (2011), *State of the Service Report 2010-11. State of the Service Series*, Australian Public Service Commission (APSC). [5]

Arundel, A., C. Bloch and B. Ferguson (2019), "Advancing innovation in the public sector: Aligning innovation measurement with policy goals", *Research Policy*, Vol. 48/3, pp. 789-798, https://doi.org/10.1016/j.respol.2018.12.001. [19]

Arundel, A., D. Bowen Butchart, S. Gatenby-Clark and L. Goedegebuure (2016), *Management and service innovations in Australian and New Zealand universities: Preliminary report of descriptive results*, LH Martin Institute, Melbourne. [90]

Arundel, A., L. Casali and H. Hollanders (2015), "How European public sector agencies innovate: The use of bottom-up, policy-dependent and knowledge-scanning innovation methods", *Research Policy*, Vol. 44/7, pp. 1271-1282, https://doi.org/10.1016/j.respol.2015.04.007. [41]

Arundel, A. and D. Huber (2013), "From too little to too much innovation? Issues in measuring innovation in the public sector", *Structural Change and Economic Dynamics*, Vol. 27, pp. 146-159, https://doi.org/10.1016/j.strueco.2013.06.009. [17]

Avvisati, F., S. Hennessyii, R. B. Kozma and S. Vincent-Lancrin (2013), "Review of the Italian Strategy for Digital Schools", *OECD Education Working Papers*, No. 90, OECD Publishing, Paris, https://doi.org/10.1787/5k487ntdbr44-en. [87]

Bellefontaine, T. (2012), *Innovation Labs: Bridging Think Tanks and Do Tanks*. [61]

Bloch, C. and M. Bugge (2013), "Public sector innovation—From theory to measurement", *Structural Change and Economic Dynamics*, Vol. 27, pp. 133-145, https://doi.org/10.1016/j.strueco.2013.06.008. [15]

Borins, S. (2014), *The persistence of innovation in government*, Brookings Institution Press, Washington, DC. [23]

Boxall, P. and J. Purcell (2011), *Strategy and Human Resource Management, third edition*, Palgrave Macmillan. [35]

Bugge, M., P. Mortensen and C. Bloch (2011), *Measuring Public Innovation in Nordic Countries*, Report on the Nordic Pilot Studies-Analyses of methodology and results. [60]

Carlsen, R. K. McFerrin, J. Price, R. Weber and D. Willis (eds.) (2007), *LIKA - Digital literacy in Teacher Education*, Association for the Advancement of Computing in Education (AACE), https://www.learntechlib.org/primary/p/24772/. [94]

Carstensen, H., C. Bason and H. Vibeke (2012), "Powering collaborative policy innovation: Can innovation labs help?", *The Innovation Journal*, Vol. 17/2. [62]

Cels, S., J. de Jong and F. Nauta (2012), *Agents of Change: Strategies and Tactics for Social Innovation*, Brookings Institution Press, Washington, DC. [46]

Chesbrough, H. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston. [56]

Christiansen, J. and L. Bunt (2012), *Innovation in Policy: Allowing for Creativity, Social Complexity and Uncertainty in Public Governance*, Nesta and MindLab, http://www.nesta.org.uk/sites/default/files/innovation_in_policy.pdf. [28]

Cinar, E., P. Trott and C. Simms (2019), "A systematic review of barriers to public sector innovation process", *Public Management Review*, Vol. 21/2, pp. 264-290, https://doi.org/10.1080/14719037.2018.1473477. [42]

Crosby, B., P. 't Hart and J. Torfing (2017), "Public value creation through collaborative innovation", *Public Management Review*, Vol. 19/5, pp. 655-669, https://doi.org/10.1080/14719037.2016.1192165. [27]

Dahlander, L. and D. Gann (2010), "How open is open innovation?", *Research Policy*, Vol. 39/6, pp. 699-709. [57]

de Vries, H., V. Bekkers and L. Tummers (2014), "Innovation in the Public Sector: A Systematic Review and Future Research Agenda", *SSRN Electronic Journal*, https://doi.org/10.2139/ssrn.2638618. [43]

Demircioglu, M. and D. Audretsch (2020), "Conditions for complex innovations: evidence from public organizations", *The Journal of Technology Transfer*, Vol. 45/3, pp. 820-843, https://doi.org/10.1007/s10961-018-9701-5. [58]

Eurofound (2012), *Work Organisation and Innovation*, http://eurofound.europa.eu/sites/default/files/ef_files/pubdocs/2012/72/en/1/EF1272EN.pdf. [25]

European Commission (2023), *SELFIE resources*, https://education.ec.europa.eu/selfie/resources. [88]

European Commission (2013), *Powering European Public Sector Innovation: Towards A New Architecture, Report of the Expert Group on Public Sector Innovation, European Commission*, European Commission, Brussels. [4]

Fernandez, S. and T. Moldogaziev (2012), "Using employee empowerment to encourage innovative behaviour in the public sector", *Journal of Public Administration Research and Theory*, Vol. 23/1, pp. 155-187. [33]

Fink, A. (2003), *The Survey Handbook*, Sage Publications, London. [96]

Foray, D. and J. Raffo (2012), "Business-Driven Innovation: Is it Making a Difference in Education?: An Analysis of Educational Patents", *OECD Education Working Papers*, No. 84, OECD Publishing, Paris, https://doi.org/10.1787/5k91dl7pc835-en. [83]

Freeman, C. (1987), *Technology Policy and Economic Performance: Lessons from Japan*, Pinter, London. [52]

Frey, B. and M. Osterloh (eds.) (2002), *Successful Management by Motivation*, Springer Berlin Heidelberg, Berlin, Heidelberg, https://doi.org/10.1007/978-3-662-10132-2. [32]

Fuller, C., M. Simmering, G. Atinc, Y. Atinc and B. Babin (2016), "Common methods variance detection in business research", *Journal of Business Research*, Vol. 69/8, pp. 3192-3198, https://doi.org/10.1016/j.jbusres.2015.12.008. [97]

Gault, F. (2018), "Defining and measuring innovation in all sectors of the economy", *Research Policy*, Vol. 47/3, pp. 617-622, https://doi.org/10.1016/j.respol.2018.01.007. [9]

Gault, F. (2012), "User innovation and the market", *Science and Public Policy*, Vol. 39/1, pp. 118-128. [16]

González-Sancho, C. and S. Vincent-Lancrin (2016), "Transforming education by using a new generation of information systems", *Policy Futures in Education*, Vol. 14/6, pp. 741-758, https://doi.org/10.1177/1478210316649287. [86]

Halász, G. (2018), "Measuring innovation in education: The outcomes of a national education sector innovation survey", *European Journal of Education*, Vol. 53/4, https://doi.org/10.1111/ejed.12299. [13]

Halász, G. (2017), *„INNOVA" Products, Downloadable Documents*, http://halaszg.elte.hu/INNOVAENGLISHWEBSITE/Products.htm (accessed on 29 January 2023). [89]

Halász, G. and F. Ágnes (2021), "Who is innovating and how in the education sector? Combining subject and object approaches", *Journal of Adult Learning, Knowledge and Innovation*, Vol. 5/1, pp. 22-35, https://doi.org/10.1556/2059.2021.00042. [14]

Hartley, J. (2006), "Innovation in governance and public services: Past and present", *Public Money & Management*, Vol. 25/1, pp. 27-34. [24]

Helfat, C., S. Finkelstein, W. Mitchell, M. Peteraf, H. Singh, D. Teece, S. G. Winter (2007), *Dynamic Capabilities: Understanding Strategic Change in Organizations*, Blackwell Publishing, Oxford. [40]

Helfat, C. and J. Martin (2014), "Dynamic Managerial Capabilities", *Journal of Management*, Vol. 41/5, pp. 1281-1312, https://doi.org/10.1177/0149206314561301. [39]

Junta Castilla y Léon (n.d.), *Herramienta de autoevaluación de la competencia digital*, https://autoevaluaciontic.educa.jcyl.es/ (accessed on 1 March 2023). [93]

Kärkkäinen, K. (2012), "Bringing About Curriculum Innovations: Implicit Approaches in the OECD Area", *OECD Education Working Papers*, No. 82, OECD Publishing, Paris, https://doi.org/10.1787/5k95qw8xzl8s-en. [81]

Kärkkäinen, K. and S. Vincent-Lancrin (2013), "Sparking Innovation in STEM Education with Technology and Collaboration: A Case Study of the HP Catalyst Initiative", *OECD Education Working Papers*, No. 91, OECD Publishing, Paris, https://doi.org/10.1787/5k480sj9k442-en. [79]

Kay, R. and C. Goldspink (2012), *What Public Sector Leaders Mean When They Say They Want to Innovate*, Incept Labs, Sydney. [6]

Kline, S. and N. Rosenberg (1986), "An overview of innovation", in *The Positive Sum Strategy: Harnessing Technology for Economic Growth*, National Academies Press, Washington, DC. [51]

Kruiter, A. et al. (2008), *De Rotonde van Hamed: Maatwerk voor Mensen met Meerdere Problemen*, Nicis Institute, Den Haag. [45]

Lubienski, C. (2009), "Do Quasi-markets Foster Innovation in Education?: A Comparative Perspective", *OECD Education Working Papers*, No. 25, OECD Publishing, Paris, https://doi.org/10.1787/221583463325. [82]

Lucas, B., G. Claxton and E. Spencer (2013), "Progression in Student Creativity in School", *OECD Education Working Papers*, Organisation for Economic Co-Operation and Development (OECD), https://doi.org/10.1787/5k4dp59msdwk-en. [78]

Lundvall, B. (ed.) (1992), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*, Pinter, London. [53]

Lunn, P. (2014), *Regulatory Policy and Behavioural Economics*, OECD, https://doi.org/10.1787/9789264207851-en. [44]

McGann, M., E. Blomkamp and J. Lewis (2018), "The rise of public sector innovation labs: experiments in design thinking for policy", *Policy Sciences*, Vol. 51/3, pp. 249-267, https://doi.org/10.1007/s11077-018-9315-7. [67]

Mevarech, Z. and B. Kramarski (2014), *Critical Maths for Innovative Societies: The Role of Metacognitive Pedagogies*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264223561-en. [76]

Mulgan, G. (2009), *The Art of Public Strategy: Mobilizing Power and Knowledge for the Common Good*, Oxford University Press, Oxford. [50]

Mulgan, G. and D. Albury (2003), "Innovation in the public sector", *Strategy Unit, Cabinet Office.*, Vol. 1/1, p. 40. [1]

Mumford, M. (2000), "Managing creative people: Strategies and tactics for innovation", *Human Resource Management Review*, Vol. 10/3, pp. 313-351. [31]

Nelson, R. (ed.) (1993), *National Innovation Systems. A Comparative Analysis*, Oxford University Press, New York/Oxford. [54]

OECD (2021), *OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, OECD Publishing, Paris, https://doi.org/10.1787/589b283f-en. [8]

OECD (2019), *Measuring Innovation in Education 2019: What has changed in the classroom?*, OECD, https://doi.org/10.1787/9789264311671-en. [11]

OECD (2017), *Fostering Innovation in the Public Sector*, OECD Publishing, Paris, https://doi.org/10.1787/9789264270879-en. [3]

OECD (2016), *Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills*, https://doi.org/10.1787/9789264265097-en. [84]

OECD (2015), *Behavioural Insights and New Approaches to Policy Design: The Views from the Field, Summary of an international seminar 23 January, Paris*, http://www.oecd.org/gov/behavioural-insights-summary-report-2015.pdf. [47]

OECD (2015), *Frascati Manual 2015*, OECD, https://doi.org/10.1787/9789264239012-en. [18]

OECD (2015), *The Innovation Imperative in the Public Sector: Setting an Agenda for Action*, OECD Publishing, Paris, https://doi.org/10.1787/9789264236561-en. [22]

OECD (2014), *Measuring Innovation in Education: A New Perspective*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264215696-en. [10]

OECD (2014), *PISA 2012 Results: Creative Problem Solving (Volume V)*, OECD, https://doi.org/10.1787/9789264208070-en. [77]

OECD (2013), *Exploring data-driven innovation as a new source of growth: Mapping the policy issues raised by "big data"*, Organisation for Economic Co-Operation and Development (OECD), https://doi.org/10.1787/9789264193307-12-en. [70]

OECD (2013), *Innovative Learning Environments*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264203488-en. [73]

OECD (2013), *Leadership for 21st Century Learning*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264205406-en. [85]

OECD (2011), *Skills for Innovation and Research*, OECD Publishing, Paris, https://doi.org/10.1787/9789264097490-en. [65]

OECD (1997), *National Innovation Systems*, https://www.oecd.org/science/inno/2101733.pdf. [55]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [12]

Osborne, S. and L. Brown (eds.) (2013), *Handbook of Innovation in Public Services*, Edward Elgar, Cheltenham. [21]

Osborne, S. and L. Brown (2011), "Innovation in public services: engaging with risk", *Public Money & Management*, Vol. 31/1, pp. 4-6, https://doi.org/10.1080/09540962.2011.545532. [48]

Osborne, S., M. Cucciniello, G. Nasi and K. Strokocsh (2021), "New development: Strategic user orientation in public services delivery—the missing link in the strategic trinity?", *Public Money & Management*, Vol. 41/2, pp. 172-175, https://doi.org/10.1080/09540962.2020.1758401. [69]

Østergaard, C., B. Timmermans and K. Kristinsson (2011), "Does a different view create something new? The effect of employee diversity on innovation", *Research Policy*, Vol. 40/3, pp. 500-509, https://doi.org/10.1016/j.respol.2010.11.004. [29]

Potts, J. and T. Kastelle (2010), "Public sector innovation research: What's next?", *Innovation*, Vol. 12/2, pp. 122-137, https://doi.org/10.5172/impp.12.2.122. [2]

Puttick, R., P. Baeck and P. Colligan (2014), *I-teams: The Teams and Funds Making Innovation Happen in Governments Around the World*, Nesta and Bloomberg Philanthropies, http://www.nesta.org.uk/sites/default/files/i-teams_june_2014.pdf. [63]

Shalley, C. and L. Gilson (2004), "What leaders need to know: A review of social and contextual factors that can foster or hinder creativity", *The Leadership Quarterly*, Vol. 15/1, pp. 33-53, https://doi.org/10.1016/j.leaqua.2003.12.004. [34]

Simmons, R. and C. Brennan (2017), "User voice and complaints as drivers of innovation in public services", *Public Management Review*, Vol. 19/8, pp. 1085-1104, https://doi.org/10.1080/14719037.2016.1257061. [38]

Sørensen, E. and J. Torfing (2011), "Enhancing Collaborative Innovation in the Public Sector", *Administration & Society*, Vol. 43/8, pp. 842-868, https://doi.org/10.1177/0095399711418768. [59]

Speier, C., J. Valacich and I. Vessey (1999), "The Influence of Task Interruption on Individual Decision Making: An Information Overload Perspective", *Decision Sciences*, Vol. 30/2, pp. 337-360, https://doi.org/10.1111/j.1540-5915.1999.tb01613.x. [72]

Torfing, J. (2019), "Collaborative innovation in the public sector: the argument", *Public Management Review*, Vol. 21/1, pp. 1-11, https://doi.org/10.1080/14719037.2018.1430248. [26]

Torjman, L. (2012), *Labs: Designing the future*, MaRS Discovery District blog, http://www.marsdd.com/systems-change/mars-solutions-lab/news/labsdesigning-future/. [64]

Torugsa, N. and A. Arundel (2017), "Rethinking the effect of risk aversion on the benefits of service innovations in public administration agencies", *Research Policy*, Vol. 46/5, pp. 900-910, https://doi.org/10.1016/j.respol.2017.03.009. [7]

Townsend, W. (2013), "Innovation and the perception of risk in the public sector", *International Journal of Organizational Innovation*, Vol. 5/3, pp. 21-34. [49]

Ubaldi, B. (2013), "Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives", *OECD Working Papers on Public Governance*, No. 22, OECD Publishing, Paris, https://doi.org/10.1787/5k46bj4f03s7-en. [71]

Vincent-Lancrin, S. (2022), *Educational innovation and digitalisation during the COVID-19 crisis: lessons for the future*, OECD, https://doi.org/10.1787/bbeca162-en. [75]

Vincent-Lancrin, S. (2017), *Understanding Innovation in Education: Where Do We Stand*, Edward Elgar Publishing, https://doi.org/10.4337/9781785369070.00013. [80]

Vincent-Lancrin, S., C. Cobo Romaní and F. Reimers (eds.) (2022), *How Learning Continued during the COVID-19 Pandemic: Global Lessons from Initiatives to Support Learners and Teachers*, OECD, https://doi.org/10.1787/bbeca162-en. [74]

Vincent-Lancrin, S., C. González-Sancho, M. Bouckaert, F. de Luca, M. Fernández-Barrerra, G. Jacotin, J. Urgel and Q. Vidal (2019), *Fostering Students' Creativity and Critical Thinking: What it Means in School*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/62212c37-en. [66]

Willis, G. (2004), *Cognitive interviewing: A tool for improving questionnaire design*, Sage publications. [98]

Windrum, P. and P. Koch (2008), *Innovation in Public Sector Services*, Edward Elgar Publishing, https://doi.org/10.4337/9781848441545. [20]

[1] These definitions have been simplified, excluding technical characteristics that are mostly applicable to the private sector.

[2] The domains of the columns are defined as follows. Skills: The abilities and skills of the workforce; Creation and diffusion of knowledge: Investment in R&D, diffusion of innovations, etc.; Governance, implementation and evaluation: Governance, implementation, and evaluation of innovations; Data management: Capacity to pool and manage information for decision-making; Innovation management

/collaboration: Structure of work and teams, collaboration within and external to the organisation; Rules and processes: Informal and formal rules affecting the organisation or parts thereof, e.g. around assessment and curriculum policy; Pro-innovation culture: The incentives, opportunities and environment for learning and experimenting within the organisation; Technology use: The use or planned use of technology within the organisation.

[3] An open question asks the respondents to provide a written answer, for instance a description of an innovation. A closed question provides a limited number of response options, such a 'yes' or 'no'.

[4] Common method bias occurs when question design creates artificial relationships between dependent and independent variables that is due to question design and not to factors of interest. Although concern over common method bias is overstated (Fuller et al., 2016[97]), using different question formats can reduce the likelihood of its occurrence.

3 Innovation surveys for education

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This chapter presents examples of innovation questionnaires that could be used by system administrators, teaching staff and school leaders in education. It starts by discussing the uses of the survey questionnaires, and their areas of focus and coverage. This is followed by a discussion of the key factors, identified in chapter 2, that feed into the questionnaires, the approach taken, and question specifics. This is followed by a discussion of each section of the questionnaire and of the questions comprising these sections. The questionnaires are included in Annex 3.A and Annex 3.B.

[1] The authors thank Anthony Arundel (University of Maastricht, Netherlands) for his thorough review of this chapter and his comments and proposed edits.

Introduction

The most common reason for innovation measurement is to obtain statistical data about the innovation activities of organisations to inform policies to support innovation. A second reason is to inform organisations about good practices for innovation, while a third reason is to support academic research into the factors that are related to good practices and outcomes.

The model innovation questionnaire for the education sector provides data for each of these three reasons. The questionnaire follows the Oslo Manual guidelines for innovation where relevant, but also incorporates lessons learnt from research on measuring innovation in the public sector and previous innovation surveys in education, as summarised in the previous chapter. Although some of these surveys were limited to specific countries, they provide insights into how to measure innovation in the education sector in other OECD countries and potentially in non-OECD countries as well. Several of the surveys also provide suggestions for identifying different types of educational organisations, not only by academic level, but also by socio-economic differences in their students.

The focus of this innovation questionnaire is on the processes and outcomes of innovation activities in education institutes, including primary and secondary schools and tertiary level institutions. However, for simplicity, this introduction often refers to “schools”.

The main factors influencing innovation in education, as identified by Van Lieshout, Arundel and Vincent-Lancrin in chapter 2 of this report, are covered in the questionnaire:

- *Pro-innovation culture*: (a) the organisational capacity for innovations, (b) working culture, incentives, and norms with respect to innovation.
- *Knowledge*: (a) staff and student capacity and capabilities; (b) investment in staff training and new initiatives; (c) skill development opportunities, (d) how knowledge is distributed, (e) collaboration within and across the organisation; (f) what is done with new insights at each level of the organisation, and (g) evaluations of innovations.
- *Innovation management*: (a) how are processes around new initiatives organised; (b) rules and plans around establishing and managing innovations.
- *Resources and drivers.*

The questionnaire combines the subject and object approaches to measuring innovation. The object approach to innovation measurement collects data on a specific, identified innovation (the object(s) of the study), in contrast to the subject approach, which focuses on the organisation and collects data on all its innovation activities (through broad innovation categories). The advantage of the subject approach is that it provides data on the workplace culture in respect to innovation and general conditions that are applicable to all innovations. This information is useful for producing indicators and for analysis. The advantage of the object approach is that it provides more accurate data on inputs and outcomes, but the data are largely of value to analysis. In addition, the questionnaire is designed for matched employer-employee analysis, with separate questionnaires for school leaders and teaching staff. Each of the two questionnaires covers similar topics, with a few exceptions.

The observation period for the questionnaire (the time period where innovation and other events occurred) is the previous two years. Where relevant, questions include “don’t know” options or provide space for respondents to provide a written description of an “other” category. The response options vary by question and include yes or no, importance (Likert) scales, and check lists.

Questionnaire structure

Both versions of the questionnaire start with an introduction that briefly describes the scope of the survey and the treatment of the respondent's data. Throughout the survey, there are terms in brackets that should be adapted to the appropriate term for the level of schooling and country context. The choice for specific terms ("school"), rather than generic terms ("educational institution") mostly stems from a desire to keep the number of terms requiring definitions to a minimum and, where possible, to use education vocabulary. Several terms are defined in the description section to ensure that all respondents share the same understanding of each of the following terms: innovation, innovation activities, educational equity, disadvantaged students, staff, and their "most important innovation".

Section 1: Reorganisation and educational reforms

Policy shifts can cause exogenously driven changes at the school, such as a major reorganisation, that may also drive endogenous innovations that result from internal processes at the school. In addition, some school systems provide a large amount of freedom for individual schools to set their own curricula, pedagogical methods, or assessment methods, whereas other systems impose a high degree of consistency across schools. In order to compare the degree of innovation or scope of innovation across schools or school systems, data on the freedom to innovate and the effects of reorganisation are required to interpret the results.

The first section of the questionnaires addresses the policy context for innovation at the school. It asks if there were any major reorganisations or education reforms in the last two years at five administrative levels (department, school, region, state, national) that can implement policies that could affect innovation activities. If the respondent replies 'yes', additional questions ask which of five operational areas of the school were affected (curriculum, pedagogical methods, design and purchase of new materials., content of individual courses, and assessment methods) (question 1.2). Question 1.3 concerns the school's 'room to innovate' in eight areas, including back-office processes, teaching, and student assessment.

Section 2: Types of innovation

Schools can implement different types of innovations that affect administration, teaching, assessments, and the physical environment, or not innovate at all. Data on whether innovation occurs (the innovation propensity) and the types of innovations that are implemented is useful for research on the effects of different drivers and processes on innovation and the skills and other knowledge requirements for different types of innovation.

Question 2.1 asks if ten areas, spanning the range of activities undertaken by schools, were affected by an innovation. The ten areas include administration, teaching, assessment, and the physical environment, as in section 1, but also innovations for communicating with students and their parents or guardians. The question also asks if no innovations have taken place.

Question 2.2 indirectly asks if the innovations (practices or materials) were obtained from external sources (the adoption of innovations) or developed within the school. Two questions deal with adoption and two with in-house development of innovations. The last questions inquires whether the school conducts pilots or experiments for possible future adoption, which are important activities for increasing the likelihood that an innovation will succeed.

The goal of digitising processes and teaching methods is a key driver of innovation in the education sector. Data on the share of innovations that rely on digital technology is a key statistic for policy makers and researchers, as technological innovations are likely to require different forms of support (whether legislative or in the form of skills or infrastructure) than other types of innovations. The last question in this section asks for the percentage of the school's innovations that relied on digital technology (question 2.4).

Section 3: Drivers of innovation

The third section of the questionnaire identifies the drivers of innovation, their relative importance, and the school's vision and goals for innovation. Drivers include factors that are directly under the influence of government, plus external factors such as student or community needs. Policies to support innovation can benefit from data on which drivers are more important to a school and if a school's innovation activities take into consideration the needs of their students and community.

Question 3.1 asks respondents to assess the importance of eleven drivers, covering three areas: top-down drivers such as mandated policies or regulations, changes in internal conditions due to restructuring, an increase in workloads, or a change in the school's budget; and bottom-up needs both inside and outside the school, such as the needs of the school's students or community, or a problem or crisis requiring an urgent response. The second question covers the school's goals for their innovations, which are relevant to the school's main tasks and may play a part in school rankings or funding (question 3.2). Several of these goals refer to the schools' external environment, such as keeping pace with technological changes or a changing economy, while others refer to the school's students and community, such as improving student achievement, increasing the well-being of the school community, and promoting equity for disadvantaged students. A question on retaining staff is only included in the version for school leaders.

The next two questions ask if the school leadership has clear objectives and a shared vision for innovation. These can both serve as drivers for innovation and are relevant to the school's innovation culture (questions 3.3 and 3.4).

Section 4: Sources of knowledge and information

Public sector organisations draw extensively on knowledge and information of relevance to innovation from external sources, including other government organisations, businesses, and the users of their innovations. This section of the questionnaire includes one question that asks about the importance of ten sources of knowledge, including governmental sources, non-governmental sources including businesses and parents, continuous professional learning and development, and online communities of educators.

Section 5: Innovation processes

The processes that a school uses to innovate are affected by its innovation culture, including employee motivation; available resources, the knowledge and capabilities of school leaders and staff to conduct innovation activities, including monitoring and evaluation; and management skills for organising innovation activities and recognising and dealing with obstacles. In sum, innovation processes cover all activities and capabilities of relevance to innovation. The expectation is that good performance on these processes should produce high-quality innovations with better outcomes.

Question 5.1 asks if there is an explicit incentive structure to reward and motivate employees to innovate. Institutionalising incentives ensures that the school is actively thinking about employee opportunities and motivation to engage in innovation, which are two key factors to ensure innovation can occur.

Question 5.2 asks if the school monitors and evaluates its innovations. These activities gather information of relevance to improving existing or trialled innovations. The evaluation methods cover both internal valuation and the collection of feedback from parents and students.

Question 5.3 covers management support for innovation and response to innovation proposals from teaching staff, both relevant to the creation of an innovation culture; and the management of innovation, such as the use of teams and meetings to discuss innovation.

Question 5.4 asks about the importance of obstacles that prevent or delay innovation. The question covers barriers posed by institutional and human constraints. The former includes workload and time pressures,

high (anticipated) risks, a lack of internal or external funding, the absence of a supportive culture for innovation, curriculum and regulatory standards, inadequate technology, and inadequate training or professional development. The human constraints cover a lack of interest or demand by potential users, fatigue with reform or innovation, lack of skills or expertise, and adverse consequences of innovation for disadvantaged students.

Question 5.5 concerns the availability of dedicated resources for innovation, in terms of extra funding or staff time, plus purchasing or developing software or ICT equipment for innovation activities.

Question 5.6 concerns innovation outcomes, with a focus on the effect of innovations on equity. Equity is not only a priority area for most school systems, but innovations can have unintended effects on equity, either directly, or by shifting resources to meet other education goals.

An additional question is only included in the questionnaire for school leaders and ask for the share of staff involved in innovation activities (question 5.7). This is related to a pro-innovation culture and whether most staff, or only a minority, participate in innovation. A higher participation share could build greater enthusiasm and support for innovation, plus create opportunities for all staff to suggest ideas or improvements. The following activities are included in this question: meetings to brainstorm ideas for innovation, working groups to develop or implement an innovation, training on how to use innovation, and sustaining or improving innovation processes.

Section 6: Most important innovation

The sixth section is limited to the school's most important innovation from the perspective of the respondent. The respondents are instructed to choose the innovation with the largest actual or expected contribution to the school's performance. Limiting questions to a single most important innovation helps respondents to provide more accurate and specific details (chapter 10 of OECD/Eurostat (2018[1])). The data for the most important innovation can also be used to analyse 'best practice' innovation methods in use by the school. Eight questions cover this innovation.

Question 6.1 asks respondents to provide a description of their most important innovation in a few sentences. This allows respondents to give details beyond the general categories for different types of innovations in section 2. Respondents may describe processes or details of the innovation that would otherwise not be captured in this survey. Depending on the level of detail provided, the information can also be used to categorise the most important innovations by their degree of novelty (Bugge and Bloch, 2016[2]).

Question 6.2 asks if the most important innovation changed each of ten work areas, including four administrative processes and six teaching and learning activities. The former covers organisational changes, use of digital technologies, and external relationships, while the latter includes lesson planning, student assessment, and education for specific student groups. This information provides context, as the purpose of the innovation is likely to influence the outcomes identified later in the questionnaire (question 6.8).

Question 6.3 is relevant to knowledge and information sources. It asks respondents to identify if each of eleven sources contributed to the original idea for the most important innovation. The items for governmental sources range from high level management to teachers and students. Non-governmental sources, include parents or guardians, the business community, leaders in the field of education, and advocacy or community groups. This information is of value to an analysis of 'bottom-up' and 'top down' innovation, such as differences in the types of changes caused by the most important innovation (question 6.2) or differences in outcomes by the source of the idea.

Question 6.4 asks if the most important innovation is completely or partially implemented, with continuing improvements or extensions underway. The definition of an innovation on the first page of the questionnaire

states that an innovation needs to be used or offered to users (i.e. implemented), but experience in other surveys shows that many respondents still describe most important innovations that are only partially implemented, with ongoing improvements. Therefore, this question is required to correctly interpret the information provided in this section, particularly for outcomes.

Question 6.5 asks about the targets (affected or intended users) for the most important innovation. The seven response options cover teachers, support staff, managers, the student body, a subsection of students (respondents are asked to specify the group), the school's external community, and parents or guardians. Data on innovation targets is of value to analysing innovation outcomes. For instance, innovations that target the school's external community are only likely to have a small (if any) effect on student outcomes.

The next two questions (6.6 and 6.7) concern collaboration, a commonly used method in the public sector for increasing knowledge about an innovation. The first question asks if the respondent was involved in deploying the innovation, to ensure that they were actively involved in the innovation. If yes, respondents are asked if they collaborated with a list of ten types of organisations or individuals. As with other questions, these include government and non-governmental collaboration partners.

The last question (6.8) on the most important innovation asks about outcomes, framed as the level of improvement or deterioration, observed or expected, for nine effects. The items in this question cover outcomes affecting the school organisation and outcomes directly affecting students. The first category includes internal operations, the school's revenue, brand, or reputation; methods or tools used in teaching, and environmental impacts. The effects on students encompass student life, the development of competences and skills, the measurement and evaluation of student performance, education for gifted students, and education for disadvantaged students.

Section 7: General information

The last section of the questionnaire collects general information for use in comparisons between schools and staff members, to permit comparisons between schools of the same type (primary, secondary, etc.) and of similar student bodies (the percentage of students that are disadvantaged or from a migrant background, etc.) Another question covers the municipal location of the school to assess urban-rural divides or the effects of remoteness, which could influence funding, the types of challenges the school faces, the quality of infrastructure, and the type of innovations that may be most suitable for the organisation. The survey also distinguishes between the type of funding (public-private), and the number of students and teaching staff.

Finally, the questionnaire collects information on the job position of the respondent and the number of years they have worked in education. The job position of the respondent (teacher, administrator, etc.) will affect their knowledge and experience of different innovation processes. The question on the respondent's job has two versions, one for tertiary education, and one for other levels of education. The version of the questionnaire for school leaders includes a different list of job positions.

This section is crucial in case of a statistical implementation of the questionnaire when governments (or relevant authorities administrating the survey) cannot easily pre-identify this information.

References

Bugge, M. and C. Bloch (2016), "Between bricolage and breakthroughs—framing the many faces of public sector innovation", *Public Money & Management*, Vol. 36/4, pp. 281-288, https://doi.org/10.1080/09540962.2016.1162599. [2]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [1]

Annex 3.A. Innovation survey for school leaders

Description

This is an innovation survey specifically targeted at [schools]. Its purpose is to collect statistical information about how this [school] approaches innovation, what motivates it to innovate, and what kind of innovations are implemented. Its main aim is to gather information that helps governments and researchers understand what innovation in the education sector looks like, and find out how to better support it. This version is specific to "[SCHOOL LEADERS]". Please answer specifically to the campus or part of the [school] you are responsible for. If you are responsible for multiple campuses, the entire [school], and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the school leader and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context. Definitions or concepts may need to be altered to fit country contexts.

Terminology	Definition
Innovation	An innovation is a new or improved product or process (or combination thereof) that differs significantly from the [school]'s previous products or processes and that has been made available to potential users (product) or brought into use by the [school] (process). (OECD/Eurostat, 2018[1])
Innovation activities	[Schools] can undertake a series of actions with the intention to develop innovations. This can require dedicated resources and engagement in specific activities, including policies, processes and procedures. (OECD/Eurostat, 2018[1])
Staff	Staff is defined as any employee of the [school]
Most important innovation	The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance. This could be related to administrative systems, teaching, student well-being, management planning, technological support, etc.
Equity in education	Equity in education means that the achievement of educational potential in a [school] is not the result of personal and social circumstances, including factors such as gender, ethnic origin, immigrant status, special education needs and giftedness. Equity can be achieved both at the [school] level and system level, but given this is a [school] survey, ensuring equitable achievement of educational potential in the institution is the key focus of this concept.
Disadvantaged students	The notion of "disadvantage" is used to qualify students in a situation of vulnerability and with diverse needs. Factors affecting disadvantage might include special needs, socio-economic status, migrant or ethnic backgrounds, sexual orientation (LGBTQI+ status), gender or giftedness. Similar terms used for such students include "vulnerable", "at-risk" or "marginalised".

1. Context on reform and innovation

ORGRES. 1.1. Please indicate if there have been major reorganisations or education reforms at the following levels:

	Yes	No	Don't know
a. One or multiple sections/departments of your [school]	☐	☐	☐
b. Your educational [school] as a whole	☐	☐	☐
c. Your relevant regional educational authority	☐	☐	☐
d. The state level	☐	☐	☐
e. The national level	☐	☐	☐

REFTYPE. 1.2 What type of education reforms have occurred? [answer if yes to any item in 1.1]

a	The curriculum	☐
b	Pedagogical methods	☐
c	Design and purchase of educational goods and services	☐
d	The content of individual courses	☐
e	Assessment methods	☐

INSCOP. 1.3 How much room does your [school] have to innovate in the following areas? (within your specific regulatory context)?

Please select all that apply.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	None	A small amount	A moderate amount	A large amount	Don't know
a. The curriculum	☐	☐	☐	☐	☐
b. Pedagogical methods	☐	☐	☐	☐	☐
c. Design and purchase of educational goods and services	☐	☐	☐	☐	☐
d. Admission policy	☐	☐	☐	☐	☐
e. General administrative methods and processes	☐	☐	☐	☐	☐
f. Content of individual courses	☐	☐	☐	☐	☐
g. Ability to run cross-curricular courses	☐	☐	☐	☐	☐
h. Assessment methods	☐	☐	☐	☐	☐

2. Types of innovation

INARE. 2.1 In the last two years, did your [school] introduce one or more innovations in the following areas: *Please select all that apply.*

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Academic programmes (e.g. a new track, programme, or interactions between courses ☐

b Specific courses ☐

c Teaching practices ☐

d Assessment methods ☐

e Administrative systems ☐

f Student support programmes ☐

g Methods for communicating with students, alumni or parents/guardians ☐

h Methods for organizing work responsibilities or decision making among your staff ☐

i Learning environments (here: the physical setting in which teaching and learning take place) ☐

j Other type of new or substantially changed activities: [please describe] ☐

k No new or substantially changed activities took place [if yes, please go to 3.1] ☐

INTYPE. 2.2 Did your [school] engage in the following types of innovative activities in the past two years: *Please select all that apply*

Innovation activities are actions taken with the intention to develop innovations.

a Introduce new practices developed by other organisations ☐

b Provide (purchase) new goods or services developed by other organisations ☐

c Introduce new practices developed within your [school] ☐

d Provide (develop) new goods or services developed within your [school] ☐

e Conduct pilots or experiments for possible future adoption ☐

IMPACT. 2.3 Which of the above was your most important innovation activity in terms of changing your practices, goods or services? _____ (insert letter)

Innovation activities are actions taken with the intention to develop innovations.

INTECH. 2.4 What percentage of your [school]'s innovations, implemented over the last two years, relied on the introduction of digital technology?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a None ☐

b Up to 25% ☐

c 25% to 50% ☐

d 50% - 75% ☐

e Over 75% ☐

f Don't know ☐

3. Drivers of innovation

INDRIV. 3.1 How important were the following factors as drivers of your [school]'s innovations over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Mandated introduction of new digital or other technical services	☐	☐	☐	☐
b. New laws or regulation that apply to your [school] (other than a)	☐	☐	☐	☐
c. New (policy) priorities driven by your [school]	☐	☐	☐	☐
d. Meeting the needs or expectations of your [school]'s external community (parents/guardians, business, etc)	☐	☐	☐	☐
e. A problem or crisis requiring an urgent response	☐	☐	☐	☐
f. Restructuring within your [school]	☐	☐	☐	☐
g. Need to improve your [school]'s brand, reputation or performance	☐	☐	☐	☐
h. A change in your [school]'s budget	☐	☐	☐	☐
i. An uncompensated increase in workload or responsibilities	☐	☐	☐	☐
j. Need to improve student academic performance	☐	☐	☐	☐
k. Need to improve the student experience	☐	☐	☐	☐
l. Other drivers: [please describe]				

DRADOP. 3.2 How important are the following factors as goals of the innovation efforts at your [school] over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Increase the overall student achievement	☐	☐	☐	☐
b. Increase the well-being of the [school] community	☐	☐	☐	☐
c. Keep pace with changing economy, skills students need for employment	☐	☐	☐	☐
d. Closing achievement gaps between disadvantaged and other students *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.*	☐	☐	☐	☐

e. Keep pace with technological changes	☐	☐	☐	☐
f. Meet national/state targets	☐	☐	☐	☐
g. Address [school] safety	☐	☐	☐	☐
h. Sustain reputation and enrolment levels	☐	☐	☐	☐
i. Retain good staff within the [school]	☐	☐	☐	☐
j. Other goals: [please describe]				

OBJINN. 3.3 The school leadership has a clear objective and theory of action when innovations are implemented.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Strongly agree ☐
b Agree ☐
c Disagree ☐
d Strongly disagree ☐
e Don't know/not applicable ☐

VISCHA. 3.4 The school leadership has shared its vision around implementing innovations with the staff (if "yes" to question 3.3).

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Strongly agree ☐
b Agree ☐
c Disagree ☐
d Strongly disagree ☐
e Don't know/not applicable ☐

4. Information/knowledge networks

SOINF. 4.1 In the last two years, how important were the following sources of ideas or information for your [school]'s innovations? (limit your answers to your areas of responsibility)

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Yourself or other managers within your [school]	☐	☐	☐	☐
b. Staff within your [school]	☐	☐	☐	☐

c. Students or student organisations at your [school]	☐	☐	☐	☐
d. Advocacy groups, education unions or non-profit organisations	☐	☐	☐	☐
e. Continuous Professional Learning and Development (CPLD) (directly or indirectly) paid for by your [school]	☐	☐	☐	☐
f. Businesses (e.g. consultants, publishers, technology companies, etc.)	☐	☐	☐	☐
g. Government agencies, departments or research institutes	☐	☐	☐	☐
h. Parents/guardians or parent-led organisations at your [school]	☐	☐	☐	☐
i. Online communities of teachers, educators, coaches or mentors independent from your [school]	☐	☐	☐	☐

5. Innovation process

EMPINC. 5.1 Is there an explicit incentive structure that rewards and motivates employees for the development, adoption and implementation of innovations?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

- Yes ☐
- No ☐
- Don't know ☐
- Other: [please describe] ☐

MTEVAL. 5.2 Does your [school] use the following methods to monitor or evaluate its innovations over the last two years?

Please select all that apply.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

- a Monitoring through key performance indicators ☐
- b Internal evaluation of innovation impacts ☐
- c Impact evaluation by external stakeholders ☐
- d Feedback from teachers (e.g. surveys, focus groups) ☐
- e Feedback from parents/guardians (e.g. surveys, focus groups) ☐
- f Feedback from students (e.g. surveys, focus groups) ☐

INMNGT. 5.3 To what degree are the following methods to support innovation used within your [school] over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not at all	Partly	Fully	Don't know/not relevant
a. A designated team works on innovation activities related to education or administration *Innovation activities are actions taken with the intention to develop innovations.*	☐	☐	☐	☐
b. The [school]'s management act as role models when it comes to implementing innovative practices	☐	☐	☐	☐
c. The [school]'s management enable, encourage and participate in a culture of sharing information on innovative practices	☐	☐	☐	☐
d. There are members of the teaching staff who can help others with developing and implementing new practices.	☐	☐	☐	☐
e. Meetings with colleagues or staff include discussions on how to change ways of working in this [school]	☐	☐	☐	☐
f. Proposed innovations by teaching staff receive feedback from management	☐	☐	☐	☐

INPREV. 5.4 Over the past two years, how important were the following factors in preventing or delaying the implementation of innovations in your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Workload and day-to-day deadlines, time pressures	☐	☐	☐	☐
b. Lack of interest or demand by potential users	☐	☐	☐	☐
c. Lack of a supportive culture for innovations	☐	☐	☐	☐
d. High (anticipated) risks	☐	☐	☐	☐
e. Lack of internal funding (e.g. earmarked funding for innovation)	☐	☐	☐	☐
f. Lack of external funding (e.g. grants, fundraising, foundations)	☐	☐	☐	☐
g. Curriculum or regulatory standards	☐	☐	☐	☐
h. Inadequate technology	☐	☐	☐	☐
i. Lack of skills or expertise	☐	☐	☐	☐
j. Inadequate training or professional development	☐	☐	☐	☐
k. Fatigue with reform or innovation	☐	☐	☐	☐

l. Adverse consequences for disadvantaged students *Students who may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.*	☐	☐	☐	☐
m. Other: [please describe]				

INBUDG. 5.5 In order to develop innovations in the last two years, did your [school]: *Please select all that apply.*

Innovation activities are actions taken with the intention to develop innovations.

a Receive extra funds specifically for innovation activities ☐
b Compensate staff (teaching hours or other benefits) involved in innovation activities ☐
c Contract out or employ additional staff to assist in innovation activities ☐
d Purchase or develop software or ICT equipment for these innovation activities ☐
e Specifically allocate part of the budget for innovation activities. ☐

INNEQU. 5.6 In general, how do you think innovations implemented at your school affect equity?

For this question we mean any kind of innovation implemented at your school, not ones specifically targeting equity.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Innovations improve equity ☐
b Innovations somewhat improve equity ☐
c Innovations do not affect equity ☐
d Innovations somewhat decrease equity ☐
e Innovations decrease equity ☐
f We do not measure the effect of innovations on equity ☐
g Don't know/not applicable ☐

EMPACT. 5.7 In the last two years, what percentage of your [school]'s staff (head count) took part in the following activities?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	None	Less than 25%	25% to 50%	50% to 75%	75% or more	Don't know
a. Meetings to brainstorm ideas for innovations	☐	☐	☐	☐	☐	☐
b. Working groups to develop or implement an innovation	☐	☐	☐	☐	☐	☐
c. Training on how to use an innovation	☐	☐	☐	☐	☐	☐
d. Sustaining or improving innovation processes	☐	☐	☐	☐	☐	☐

6. Most important innovation

INDESC. 6.1 In a few sentences, please describe your [school]'s most important innovation in the last two years. The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance. This could be related to administrative systems, teaching, student well-being, management planning, etc.

INTYPE. 6.2. Which of the following areas of work were changed as part of your most important innovation? Please provide an answer for each line.

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

	Yes	No	Don't know
a. Internal organisation (e.g. work organisation, management, infrastructure management, etc.)	☐	☐	☐
b. The technical means related to the operation of the [school] (e.g. electronic register, internal correspondence, management information system)	☐	☐	☐
c. Use of technical equipment in education	☐	☐	☐
d. Methods and tools related to the planning and implementation of lessons	☐	☐	☐
e. Evaluation or measurement of student performance	☐	☐	☐
f. More effective development of competences and skills of students	☐	☐	☐
g. Education for gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐
h. Education for disadvantaged and special educational needs students *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds. Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐
i. Activities outside of the classroom (e.g. study tours, field work, independent homework)	☐	☐	☐
j. External relations with partners / beneficiaries (e.g. local community, parents/guardians, employers, NGOs, training users)	☐	☐	☐
k. Other areas [please specify]:			

SOINFO. 6.3 Where did the original idea for this most important innovation come from?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a The [principal] ☐
b Managers (e.g. a section leader, vice-principal or equivalent) ☐
c Teaching staff ☐
d Support staff (e.g. administrative assistants, concierges)) ☐
e ICT staff ☐
f Students ☐

g Parents/guardians ☐
h Education officials (on either a national, state, or a regional level) ☐
i Business community ☐
j Leaders in the field of education ☐
k Advocacy groups and/or community groups ☐
l Other: [please describe] ☐
m Don't know ☐

IMPSTG. 6.4 Is this most important innovation completely or partially implemented?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a Completely implemented ☐
b Partially implemented, with continuing improvements or extensions underway ☐

INOTAR. 6.5 Who were the targets (affected or intended users) for this most important innovation?

Please select all that apply.

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a Teaching staff ☐
b Support staff ☐
c Managers ☐
d The student body ☐
e A subsection of students, namely: [please describe here] ☐
f The [school]'s external community ☐
g Parents/guardians ☐
h Other: [please describe] ☐

COLPAR. 6.6 Were you involved in the deployment of this most important innovation?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

Yes ☐
No ☐
Don't know/not relevant ☐

INOCOL. 6.7 If you were involved in the deployment of this most important innovation, please indicate whether you collaborated with any of the following actors. [if "yes" to question 6.6].

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a	Staff at your [school]	☐
b	Student organisations at your [school]	☐
c	Other [schools]	☐
d	Consultants or other businesses (e.g. technological firms or banks)	☐
e	ICT experts	☐
f	Non-Governmental Organisations (NGOs)	☐
g	Government agencies or departments	☐
h	Universities or research institutes	☐
i	Alumni of your [school]	☐
j	Parents/guardians	☐
k	Other: [please describe]	☐

INOEFF. 6.8 What effects did this most important innovation have on the following outcomes?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

	Strong improvement	Improvement	No effect or change	Deterioration	Strong deterioration	Don't know
a. Internal operations (e.g. administration, infrastructure management, employee working conditions)	☐	☐	☐	☐	☐	☐
b. The [school]'s revenue, brand or reputation	☐	☐	☐	☐	☐	☐
c. Methods or tools used in teaching (e.g. technical equipment, pedagogical methods)	☐	☐	☐	☐	☐	☐
d. Student life (enrolment, satisfaction, out-of-classroom activities, student well-being)	☐	☐	☐	☐	☐	☐
e. The development of competences and skills of students	☐	☐	☐	☐	☐	☐
f. The measurement and evaluation of student performance	☐	☐	☐	☐	☐	☐
g. Education for disadvantaged and special needs students (e.g. improving equity) *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.* *Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐	☐	☐	☐
h. Education for gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐	☐	☐	☐
i. The environmental impact of the [school]	☐	☐	☐	☐	☐	☐
j. Other: please describe						

7. General information [section optional: only needed without pre-identification]

EDULEV. 7.1 Your [school] provides:

- a Early childhood education ☐
- b Primary education ☐
- c General secondary education ☐
- d General tertiary education ☐
- e (Secondary and Tertiary) vocational education ☐

ORGLOC. 7.2 Which of the following best describes the location of your [school]?

- a A village, hamlet or rural area (up to 3 000 people) ☐
- b A small town (3 001 to 15 000 people) ☐
- c Town (15 001 to 100 000 people) ☐
- d City (100 001 to 1 000 000 people) ☐
- e Large city (more than 1 000 000 people) ☐

PUBPRI. 7.3 What kind of [school] is this?

- a Public ☐

  This is a school managed by a public education authority, government agency, municipality, or governing board appointed by government or elected by public franchise
- b Government-dependent private ☐

  This is a school managed by a non-government organisation (e.g. a church, trade union, business or other private institution) that receives more than 50% of their core funding from government agencies or their teaching personnel is paid by a government agency
- c Independent private ☐

  This is a school managed by a non-government organisation that receives less than 50% of their core funding from government agencies and their teaching personnel are not paid by a government agency

ORGSIZ. 7.4 How many students did your [school] have in [this year]?

The approximate number of students is fine.

Number of students (Full Time Equivalent): _____

STASIZ. 7.5 What number of teaching staff does your [school] have in [this year]?

Staff is defined as any employee of the [school].

Number of teaching staff (Full Time Equivalent): _____

SHADIS. 7.6. Please estimate the broad percentage of students in your [school] who have the following characteristics. Students may fall into multiple categories. (Definitions for these terms can be found at the end of the survey).

	0	1-10%	11-30%	31-60%	>60%	Don't know
a. Students with special educational needs *(Students affected by learning disabilities, physical impairments and/or who suffer from mental disorders.)*	☐	☐	☐	☐	☐	☐
b. Socio-economically disadvantaged students *(students who grow up in low-income families and tend to have lower health and education outcomes than other groups.)*	☐	☐	☐	☐	☐	☐
c. Students from a migrant background *People are considered to have an immigrant background or to have an immigrant-heritage if they or at least one of their parents was born in a country that is different from the country in which they go to [school].*	☐	☐	☐	☐	☐	☐
d. Students from a visible minority *(a student that comes or is considered to come from a different ethnic background than the majority population in the country)*	☐	☐	☐	☐	☐	☐
e. Students whose first language is different from the language of instruction or a dialect of this/these languages	☐	☐	☐	☐	☐	☐

PRROL. 7.7a (<u>if NOT tertiary education</u>) Which of the following best describes your current professional role?

a District administrator, head of a school collective ☐
b School principal ☐
c Vice/Deputy Principal, Assistant Principal ☐
d Other: [please describe] ☐

PRROL. 7.7b (<u>IF tertiary education</u>) Which of the following best describes your current professional role?

a Dean ☐
b Vice Dean, Head of Department ☐
c Professor, Associate Professor, Assistant Professor, Lecturer, Reader ☐
d Other: [please describe] ☐

PROEXP 7.8 How long have you worked in education leadership?

Number of years: _____

Definitions

Terminology	Definition
Gifted students	Gifted students are students who have been classified as having significantly higher than expected intellectual abilities given their age, with intellectual abilities being assessed through psychometric tests of cognitive functioning and/or performance in classroom evaluations. Students can also be considered to be gifted in specific domains that are not strictly academic in nature, such as music. Some countries include giftedness among the conditions included in special education needs. The project understands giftedness as a separate dimension of induced diversity in student populations and will be treated as such throughout the survey.
Socio-economic status (socio-economically disadvantaged students)	Socio-economic status is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others. Socio-economic disadvantage, in this context, consists of students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.
Students from a migrant background	Individuals are considered to have an immigrant background or to have an immigrant-heritage if they or at least one of their parents was born in a country that is different from the country in which they access educational services.
Students from a visible minority ethnicity	Ethnicity refers to a group or groups to which people belong, and/or are perceived to belong, as a result of historical dynamics as well as certain shared characteristics. Minority ethnicity students come or are considered to come from a different ethnic background than the majority population in the country.
Students with special education needs (SEN)	“Special education needs” is a term used in many education systems to characterise the broad array of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders.

Annex 3.B. Innovation survey for teaching staff

Description

This is an innovation survey specifically targeted at [schools]. Its purpose is to collect statistical information about how this [school] approaches innovation, what motivates it to innovate, and what kind of innovations are implemented. Its main aim is to gather information that helps governments and researchers understand what innovation in the education sector looks like, and find out how to better support it. This version is specific to "[TEACHING STAFF]". Please answer specifically to the campus or part of the [school] you are responsible for. If you teach at multiple campuses and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the school leader and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context. Definitions or concepts may need to be altered to fit country contexts.

Terminology	Definition
Innovation	An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). (OECD/Eurostat, 2018[1])
Innovation activities	Institutional units can undertake a series of actions with the intention to develop innovations. This can require dedicated resources and engagement in specific activities, including policies, processes and procedures. (OECD/Eurostat, 2018[1])
Staff	Staff is defined as any employee of the [school]
Most important innovation	The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance. This could be related to administrative systems, teaching, student well-being, management planning, technological support, etc.
Equity in education	Equity in education means that the achievement of educational potential in a [school] is not the result of personal and social circumstances, including factors such as gender, ethnic origin, immigrant status, special education needs and giftedness. Equity can be achieved both at the [school] level and system level, but given this is a [school] survey, ensuring equitable achievement of educational potential in the institution is the key focus of this concept.
Disadvantaged students	The notion of "disadvantage" is used to qualify students in a situation of vulnerability and with diverse needs. Factors affecting vulnerability might include special needs, socio-economic status, migrant or ethnic backgrounds, LGBTQI+ status, gender or giftedness. Similar terms used for such students include "vulnerability", "at-risk" or "marginalised".

1. Context on reform and innovation

ORGRES.1.1. Please indicate if there have been major reorganisations or education reforms at the following levels in the last two years:

	Yes	No	Don't know
a. One or multiple sections/departments of your [school]	☐	☐	☐
b. Your [school] as a whole	☐	☐	☐
c. Your relevant regional educational authority	☐	☐	☐
d. The state level	☐	☐	☐
e. The national level	☐	☐	☐

REFTYPE. 1.2. Which of the following areas have been affected by education reforms? [answer if yes to any item in 1.1]

a	The curriculum	☐
b	Pedagogical methods	☐
c	Design and purchase of new materials, activities or pedagogies	☐
d	The content of individual courses	☐
e	Assessment methods	☐

INSCOP. 1.3. How much room does your [school] have to innovate in the following areas? (within your specific regulatory context)?

Please select all that apply.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	None	A small amount	A moderate amount	A large amount	Don't know
a. The curriculum	☐	☐	☐	☐	☐
b. Pedagogical methods	☐	☐	☐	☐	☐
c. Design and purchase of learning materials	☐	☐	☐	☐	☐
d. Admission policy	☐	☐	☐	☐	☐
e. General administrative methods and processes	☐	☐	☐	☐	☐
f. Content of individual courses	☐	☐	☐	☐	☐
g. Ability to run cross-curricular courses	☐	☐	☐	☐	☐
h. Assessment methods	☐	☐	☐	☐	☐

2. Types of innovation

INARE. 2.1 In the last two years, did you (help) introduce one or more innovations in the following areas: *Please select all that apply.*

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Academic programmes (e.g. a new track, programme, or interactions between courses) ☐
b Specific courses ☐
c Teaching practices ☐
d Assessment methods ☐
e Administrative systems ☐
f Student support programmes ☐
g Methods for communicating with students, alumni or parents/guardians ☐
h Methods for organizing work responsibilities or decision making among your staff ☐
i Learning environments (here: the physical setting in which teaching and learning take place) ☐
j Other type of new or substantially changed activities: [please describe] _____ ☐
k No new or substantially changed activities took place [If yes, please go to 4.1] ☐

INTYPE. 2.2 Did you engage in the following types of innovative activities in the past two years:

Please select all that apply

Innovation activities are actions taken with the intention to develop innovations.

a Introduce new practices developed by other [schools] ☐
b Provide (purchase) new materials, activities or pedagogies developed by other [schools] ☐
c Introduce new practices developed within your [school] ☐
d Provide (develop) new materials, activities or pedagogies developed within your [school] ☐
e Conduct pilots or experiments for possible future adoption ☐

IMPACT. 2.3 Which of the above was your most important innovation activity in terms of changing your practices, materials, activities or pedagogies? _____ (insert letter)

Innovation activities are actions taken with the intention to develop innovations.

INTECH. 2.4 What percentage of your innovations, implemented over the last two years, relied on the introduction of digital technology?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a None ☐
b Up to 25% ☐
c 25% to 50% ☐
d 50% - 75% ☐
e Over 75% ☐
f Don't know ☐

3. Drivers of innovation

INDRIV. 3.1 How important were the following factors as drivers of your innovations over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Mandated introduction of new digital or new technical services	☐	☐	☐	☐
b. New laws or regulations that apply to your [school] (other than **a.**)	☐	☐	☐	☐
c. New (policy) priorities driven by your [school]	☐	☐	☐	☐
d. Meeting the needs or expectations of your [school]'s external community (parents/guardians, business, etc)	☐	☐	☐	☐
e. A problem or crisis requiring an urgent response	☐	☐	☐	☐
f. Restructuring within your [school]	☐	☐	☐	☐
g. Need to improve your [school]'s image, reputation or performance	☐	☐	☐	☐
h. A change in your [school]'s or section's budget	☐	☐	☐	☐
i. An uncompensated increase in workload or responsibilities	☐	☐	☐	☐
j. Need to improve student academic performance	☐	☐	☐	☐
k. Need to improve the student experience	☐	☐	☐	☐
l. Other drivers: [please describe]				

DRADOP. 3.2 How important are the following factors as goals of your innovation efforts over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Increase the overall student achievement	☐	☐	☐	☐
b. Increase the well-being of the [school] community	☐	☐	☐	☐
c. Keep pace with changing economy, skills students need for employment	☐	☐	☐	☐
d. Closing achievement gaps between disadvantaged and other students *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.*	☐	☐	☐	☐
e. Keep pace with technological changes	☐	☐	☐	☐
f. Meet national/state targets	☐	☐	☐	☐
g. Address school safety	☐	☐	☐	☐
h. Other goals: [please describe]				

OBJINN. 3.3 The school leadership has a clear objective and theory of action when innovations are implemented.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Strongly agree ☐
b Agree ☐
c Disagree ☐
d Strongly disagree ☐
e Don't know/not applicable ☐

VISCHA. 3.4 The school leadership has shared its vision around implementing innovations with the staff. [if "yes" to question 3.3)

a Strongly agree ☐
b Agree ☐
c Disagree ☐
d Strongly disagree ☐
e Don't know/not applicable ☐

4. Information/knowledge networks

SOINF. 4.1 In the last two years, how important were the following sources of ideas or information for your innovations? (limit your answers to your areas of responsibility).

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Managers within your [school]	☐	☐	☐	☐
b. Yourself or other staff within your [school]	☐	☐	☐	☐
c. Staff in other sections of your [school]	☐	☐	☐	☐
d. Students or student organisations at your [school]	☐	☐	☐	☐
e. Advocacy groups, education unions. or non-profit organisations	☐	☐	☐	☐
f. Continuous Professional Learning and Development (CPLD) (directly or indirectly) paid for by your [school]	☐	☐	☐	☐
g. Businesses (e.g. consultants, publishers, technology companies, etc.)	☐	☐	☐	☐
h. Government agencies, departments or research institutes	☐	☐	☐	☐
i. Parents/guardians or parent-led organisations at your [school]	☐	☐	☐	☐
j. Online communities of teachers, educators, coaches or mentors independent from your [school]	☐	☐	☐	☐

5. Innovation process

EMPINC. 5.1 Is there an explicit incentive structure that rewards and motivates you for the development, adoption and implementation of innovations?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

- Yes ☐
- No ☐
- Don't know ☐
- Other: [please describe] ☐

MTEVAL. 5.2 Does your [school] use the following methods to monitor or evaluate its innovations over the last two years?

Please select all that apply.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

- a Monitoring through key indicators ☐
- b Internal evaluation of innovation impacts ☐
- c Impact evaluation by external stakeholders ☐
- d Feedback from teachers (e.g. surveys, focus groups) ☐
- e Feedback from parents/guardians (e.g. surveys, focus groups) ☐
- f Feedback from students (e.g. surveys, focus groups) ☐

INMNGT. 5.3 To what degree are the following methods to support innovation used within your [school] over the last two years?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not at all	Partly	Fully	Don't know/not relevant
a. A designated team works on innovation activities related to education or administration *Innovation activities are actions taken with the intention to develop innovations.*	☐	☐	☐	☐
b. The [school] management acts as role models when it comes to implementing innovative practices	☐	☐	☐	☐
c. The [school] management enables, encourages and participates in a culture of sharing information on innovative practices	☐	☐	☐	☐
d. There are members of the teaching staff who can help others with developing and implementing new practices.	☐	☐	☐	☐
e. Meetings with colleagues or staff frequently include discussions on how to change ways of working in the [school]	☐	☐	☐	☐
f. Proposed innovations by teaching staff always receive feedback from management	☐	☐	☐	☐

INPREV. 5.4 Over the past two years, how important were the following factors in preventing or delaying the implementation of your innovations?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Workload and day-to-day deadlines, time pressures	☐	☐	☐	☐
b. Lack of interest or demand by potential users	☐	☐	☐	☐
c. Lack of a supportive culture for new or significant improved activities	☐	☐	☐	☐
d. High (anticipated) risks	☐	☐	☐	☐
e. Lack of internal funding (e.g. earmarked funding for innovation)	☐	☐	☐	☐
f. Lack of external funding (e.g. grants, fundraising, foundations)	☐	☐	☐	☐
g. Curriculum or regulatory standards	☐	☐	☐	☐
h. Inadequate technology	☐	☐	☐	☐

i. Lack of skills or expertise	☐	☐	☐	☐
j. Inadequate training or professional development	☐	☐	☐	☐
k. Fatigue with reform or innovation	☐	☐	☐	☐
l. Adverse consequences for disadvantaged students *Students who may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.*	☐	☐	☐	☐
m. Other: [please describe]				

INBUDG. 5.5 In order to develop innovations in the last two years, did your [school]: *Please select all that apply.*

Innovation activities are actions taken with the intention to develop innovations.

a Provide extra funds for innovation activities to you or your colleagues ☐

b Compensate (teaching hours or other benefits) you or your colleagues involved in innovation activities ☐

c Provide the help of additional staff to you or your colleagues for innovation activities ☐

d Allow you or your colleagues to purchase or develop software or ICT equipment ☐

e Receive additional budget for innovation activities ☐

INNEQU. 5.6 In general, how do you think innovations implemented at your school affect equity?

For this question we mean any kind of innovation implemented at your school, not ones specifically targeting equity.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

a Innovations improve equity ☐

b Innovations somewhat improve equity ☐

c Innovations do not affect equity ☐

d Innovations somewhat decrease equity ☐

e Innovations decrease equity ☐

f We do not measure the effect of innovations on equity ☐

g Don't know/not applicable ☐

6. Most important innovation

INDESC. 6.1 In a few sentences, please describe your [school]'s most important innovation in the last two years. The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance. This could be related to administrative systems, teaching, student well-being, management planning, etc.

INTYPE. 6.2. Which of the following areas of work were changed as part of your most important innovation? Please provide an answer for each line.

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

	Yes	No	Don't know
a. Internal organisation (e.g. work organisation, management, infrastructure management, etc.)	☐	☐	☐
b. The technical means related to the operation of the [school] (e.g. electronic register, internal correspondence, management information system)	☐	☐	☐
c. Use of technical equipment in education	☐	☐	☐
d. Methods and tools related to the planning and implementation of lessons	☐	☐	☐
e. Evaluation or measurement of student performance	☐	☐	☐
f. More effective development of competences and skills of students	☐	☐	☐
g. Education for gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐
h. Education for disadvantaged and special educational needs students *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.* *Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐
i. Activities outside of the classroom (e.g. study tours, field work, independent homework)	☐	☐	☐
j. External relations with partners / beneficiaries (e.g. local community, parents/guardians, employers, NGOs, training users)	☐	☐	☐
k. Other areas [please specify]:			

SOINFO. 6.3 Where did the original idea for this most important innovation come from?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a	The principal/dean	☐
b	Managers (e.g. a section leader, vice-principal or equivalent)	☐
c	Teaching staff	☐
d	Support staff (e.g. administrative assistants, concierges))	☐
e	IT staff	☐
f	Students	☐
g	Parents/guardians	☐
h	Education officials (on either a national, state, or a regional level)	☐
i	Business community	☐
j	Leaders in the field of education	☐

k Advocacy groups and/or community groups ☐
l Other: [please describe] ☐
m Don't know ☐

IMPSTG. 6.4 Is this most important innovation completely or partially implemented?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a Completely implemented ☐
b Partially implemented, with continuing improvements or extensions underway ☐

INOTAR. 6.5 Who were the targets (affected or intended users) for this most important innovation? *Please select all that apply.*

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a Teachers ☐
b Support staff ☐
c Managers ☐
d The student body ☐
e A subsection of students, namely: [please describe here] ☐
f The [school]'s external community ☐
g Parents/guardians ☐
h Other: [please describe] ☐

COLPAR. 7.6 Were you involved in the deployment of this most important innovation?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

Yes ☐
No ☐
Don't know/not relevant ☐

INOCOL. 6.7 If you were involved in the deployment of this most important innovation, please indicate whether you collaborated with any of the following actors. [if "yes" to question 6.6].

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

a	Other staff in your [school]	☐
b	Student organisations at your [school]	☐
c	Other [schools]	☐
d	Consultants or other businesses (e.g. technological firms or banks)	☐
e	ICT experts	☐
f	Non-Governmental Organisations (NGOs)	☐
g	Government agencies or departments	☐
h	Universities or research institutes	☐
i	Alumni of your [school]	☐
j	Parents/guardians	☐
k	Other: [please describe]	☐

INOEFF. 6.8 What effects did this most important innovation have on the following outcomes?

The most important innovation is defined as the innovation with the largest actual or expected contribution to the [school]'s performance.

	Strong improvement	Improvement	No effect or change	Deterioration	Strong deterioration	Don't know
a. Internal operations (e.g. administration, infrastructure management, employee working conditions)	☐	☐	☐	☐	☐	☐
b. The [school]'s revenue, brand or reputation	☐	☐	☐	☐	☐	☐
c. Methods or tools used in teaching (e.g. technical equipment, pedagogical methods)	☐	☐	☐	☐	☐	☐
d. Student life (enrolment, satisfaction, out-of-classroom activities, student well-being)	☐	☐	☐	☐	☐	☐
e. The development of competences and skills of students	☐	☐	☐	☐	☐	☐
f. The measurement and evaluation of student performance	☐	☐	☐	☐	☐	☐
g. Education for disadvantaged and special needs students (e.g. improving equity) *Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.* *Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐	☐	☐	☐
h. Education for gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐	☐	☐	☐
i. The environmental impact of the [school]	☐	☐	☐	☐	☐	☐
j. Other: please describe						

7. General information [section optional: only needed without pre-identification]

EDULEV. 7.1 This [school] provides:

a Early childhood education ☐
b Primary education ☐
c General secondary education ☐
d General tertiary education ☐
e (Secondary and Tertiary) vocational education ☐

ORGLOC. 7.2 Which of the following best describes the location of your [school]?

a A village, hamlet or rural area (up to 3 000 people) ☐
b A small town (3 001 to 15 000 people) ☐
c Town (15 001 to 100 000 people) ☐
d City (100 001 to 1 000 000 people) ☐
e Large city (more than 1 000 000 people) ☐

PUBPRI. 7.3 What kind of [school] is this?

a Public ☐

This is a [school] managed by a public education authority, government agency, municipality, or governing board appointed by government or elected by public franchise

b Government-dependent private ☐

This is a [school] managed by a non-government organisation (e.g. a church, trade union, business or other private institution) that receives more than 50% of their core funding from government agencies or their teaching personnel is paid by a government agency

c Independent private ☐

This is a [school] managed by a non-government organisation that receives less than 50% of their core funding from government agencies and their teaching personnel are not paid by a government agency

SHADIS. 7.4. Please estimate the broad percentage of students in your [school] who have the following characteristics. Students may fall into multiple categories. (Definitions for these terms can be found at the end of the survey).

	0	1-10%	11-30%	31-60%	>60%	Don't know
a. Students with special educational needs *(Students affected by learning disabilities, physical impairments and/or who suffer from mental disorders)*	☐	☐	☐	☐	☐	☐
b. Socio-economically disadvantaged students (e.g. *students lacking the necessities or advantages of life, such as adequate housing, nutrition or medical care)*	☐	☐	☐	☐	☐	☐
c Students from a migrant background *People are considered to have an immigrant background or to have*	☐	☐	☐	☐	☐	☐

an immigrant-heritage if they or at least one of their parents was born in a country that is different from the country in which they go to [school].						
d. Students from a visible minority *(a student that comes or is considered to come from a different ethnic background than the majority population in the country – to be adapted by country)*	☐	☐	☐	☐	☐	☐
e. Students whose first language is different from the language of instruction or a dialect of this/these languages	☐	☐	☐	☐	☐	☐

PRROL. 7.5a (<u>if NOT tertiary education</u>) Which of the following best describes your current professional role?

a Teaching staff ☐
b Teaching assistant ☐
c Administrative employee ☐
d Other: [please describe] ☐

PRROL. 7.5b (<u>IF tertiary education</u>) Which of the following best describes your current professional role?

a Professor ☐
b Associate professor ☐
c Assistant professor/lecturer/reader ☐
d Teaching assistant ☐
e Administrative employee ☐
f Other: [please describe] ☐

PROEXP. 7.6 How long have you worked in education?

Number of years: _____

Definitions

Terminology	Definition
Gifted students	Gifted students are students who have been classified as having significantly higher than expected intellectual abilities given their age, with intellectual abilities being assessed through psychometric tests of cognitive functioning and/or performance in classroom evaluations. Students can also be considered to be gifted in specific domains that are not strictly academic in nature, such as music. Some countries include giftedness among the conditions included in special education needs. The project understands giftedness as a separate dimension of induced diversity in student populations and will be treated as such throughout the survey.
Socio-economic status (socio-economically disadvantaged students) and geographic locations (students from specific geographic areas)	Socio-economic status is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others. Socio-economic disadvantage, in this context, consists of students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.
Students from a migrant background	Individuals are considered to have an immigrant background or to have an immigrant-heritage if they or at least one of their parents was born in a country that is different from the country in which they access educational services.
Students from a visible minority	Ethnicity refers to a group or groups to which people belong, and/or are perceived to belong, as a result of historical dynamics as well as certain shared characteristics. Minority ethnicity students come or are considered to come from a different ethnic background than the majority population in the country.
Students with special education needs (SEN)	“Special education needs” is a term used in many education systems to characterise the broad array of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders.

4 Self-reflection questionnaire on educational establishments' innovation culture

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This chapter explores how schools' and universities' innovation culture could be measured using a self-reflective questionnaire. Those are short questionnaires that could be used as modules in other questionnaires with a different overall topic. They could also be used as such for an organisation reflection. The first section details related work and the focus of these questionnaires, as well as the different versions for school leaders, teaching staff, and students. Then, the definitional underpinnings and target audiences are discussed. The second part of this chapter covers the structure of the question module and some differences between the versions. Lastly, different sections of the chapter discuss each question and items, their focus, and the relevance of these items to the module. The module questionnaires themselves are presented in Annex 4.A, Annex 4.B and Annex 4.C.

Introduction

The short module of questions on innovation culture includes self-reflective and evaluation questions and follows other questionnaires on work culture, for instance Amabile's questionnaire discussed in Chapter 2. The topic of innovation culture deserves a module because it provides the foundation for the other three innovation components discussed in the companion report: innovation management, knowledge and information, and resources and drivers. There are three separate versions of the module to capture the insights and reflections of school leaders, teaching staff, and students.

The module is designed to be added to existing questionnaires, such as the self-reflective SELFIE questionnaire of the European Commission, which delves into school infrastructure and capacity to engage with digitalisation. The module would complement SELFIE by collecting information on the enabling and supporting culture for innovation. It could also be used in international or domestic surveys. Another possible use is a separate administration within establishments. It shows how one could capture relevant information within a relatively small number of items.

The module begins with a description of its purpose and provides definitions of the main terms: innovation and innovation activities, with definitions from the Oslo Manual (OECD/Eurostat, 2018[1]); and creativity and critical thinking skills, with definitions taken from the report *Fostering Students' Creativity and Critical Thinking: What it Means in School* (Vincent-Lancrin et al., 2019[2]). The questionnaire is suitable for all types of educational institutions, including schools and tertiary education. It instructs school or tertiary education leaders to answer the questions for their entire institution and teachers at tertiary education institutions to answer for the part of the institution where they teach. This can either yield statistics if administered with a probability sample or lead to internal discussions within the establishments that collect the data.

Module structure

The module includes eight questions, each with several sub-questions. The student survey is considerably shorter and does not directly ask about innovation. It includes a question on the student's year of study to contextualise their answers and permit comparisons across years or schools. Some of the questions could be more applicable to students in higher grades. Students answering yes or no to such items should be evaluated differently depending on their grade level.

With one exception, the response categories for all questions in all three versions consists of an importance scale ranging from 'strongly agree' to 'strongly disagree' along with a "Don't know" option. The exception is a question on obstacles to innovation, which uses an importance scale, and question 1.3 in the version for school leaders which uses the share of staff engaged in specific innovation activities.

Leadership and management

Question 1.1 asks respondents for their level of agreement with statements on the school's leadership and management strategies. The questions probe management receptiveness and support for innovation. Several questions ask about management support for including diverse voices, such as teachers, students, and parents, in innovation activities and in providing ideas for innovations. Their inclusion collects input and knowledge from different perspectives and should be particularly important for teaching and learning innovations.

Different sub-questions are included in the three module versions. The six statements for the teacher survey cover management participation in innovation, provision of a clear vision of how changes will lead to improvements, empowering staff to innovate, encouraging students to propose innovations, giving teachers a role in innovation, and taking new ideas and proposals seriously, regardless of their source.

The version for school leaders also asks if the school's innovation strategy includes the knowledge and skills of all staff and if there are dedicated teams working on innovation that include teachers, students, and parents.

The version for students uses different language to ensure understanding, different questions to obtain student perspectives, and asks the questions in different ways. For example, the first sub-question probes if school leaders encourage students to propose new ways of doing things at the school, while the second sub-question asks students to reflect on how often the school changes how it does things (in and outside the classroom).

Approaches to the innovation process

Question 1.2 collects data on the methods used by the school to involve teachers and students in innovation and the specific ways in which teachers or students are involved. For example, the question for teachers provides statements on the respondent's perspective on activities to support innovation ("this school has good processes in place for encouraging and developing innovative ideas") and if the respondent has received support for involvement in innovation activities ("I am rewarded for experimenting with or improving on current practices", "I can get the resources I need to try out new practices", "I receive feedback for every innovative idea I suggest"). These are direct measures of the practical implications of the school's innovation culture, including resources. Ten similar statements are included in the version for school leaders.

There is no equivalent question for students, but students are given seven statements about their involvement in activities that are related to innovation. Examples include "I have been part of groups with teachers or school leaders where we think about new ideas at my school" and "My teachers have responded to suggestions from me or other students in the class to change how they teach".

Staff involvement in innovation and skills for innovation

Question 1.3 is similar to the second question, but for teaching staff it includes statements on the respondent's personal involvement in innovation and their innovation skills, while the version for school leaders includes statements on the entire staff. There is no equivalent question for students.

The questions on involvement for teachers cover collaboration ("I am involved with collaborative projects with other schools on innovation in education") and new practices ("I have adopted new practices into my daily work within the last year"). The questions on skills cover current levels ("I have the skills I need to develop innovative activities or materials") and the effect of involvement in innovation on developing skills ("participating in innovation activities develops my professional skills").

The collection of information on how many staff are involved in collaboration is useful as part of improving information flows with other schools, while responses to the adoption of new practices provide baseline data for the percentage of staff that are actively innovating. The question on skills determines if staff believe their skills are sufficient and combined with the perception of staff skills by school leadership, could identify whether additional training might be necessary.

Barriers to innovation

Question 1.4 is identical for school leaders and teachers and covers the importance of six factors in constraining the ability of the respondent to innovate. The question is not included in the student version of the module.

The sub-questions cover government regulations or practices, the school's internal regulations or practices, the social context, such as community support; the respondent's skills, a lack of resources, and

frequent staff turnover. Over the short term, there is little that respondents can do about government regulations, but information on internal regulations or practices could provide feedback for the school leadership about problems, leading to a dialogue about possible changes to remove or reduce these obstacles. Issues with the social context would suggest a need for the school to build better support for innovations among its stakeholders or work with their community to identify necessary changes.

Personnel resources and knowledge inputs

Question 1.5 concerns resources for innovation and users or stakeholder involvement in innovation. Two questions on resources ask if a dedicated person is available to assist staff with innovations and if a dedicated person is responsible for applying for funding. Three questions on user or stakeholder involvement ask if teachers, students, or parents/guardians "are involved in the design or planning of innovations". The questions are very similar for teachers and school leaders, but the question is not included in the module for students.

The presence of dedicated personnel to assist innovations or apply for funding will lower the personal costs for teachers to participate in innovation, create 'institutional expertise' around innovation, and ensure that there is someone who knows of funding opportunities and how to structure a funding request. The other questions determine if innovations are developed with user input, which should improve the quality and effectiveness of innovations for teaching and learning (Osborne, Radnor and Strokosch, 2016[3]; Osborne et al., 2021[4]).

Problem-solving and risk

The version of question 1.6 for teachers asks how the respondents solve problems and their attitudes to risks, while the version for school leaders asks about the school approach to risk. The question is not asked in the student version, although students are asked if they learn from their mistakes. The extent to which the school is willing to take risks affects both its likelihood to innovate and the scope of its innovations. Finding the right balance between a positive risk-taking attitude and being thorough during the innovation process is important. Pilot tests and experimentation can require acceptance of risk, but too much risk taking could result in suboptimal outcomes.

The two questions on risk for teachers address ways of managing risk: "I think it is important to take measured risks to improve teaching and learning" and "failure is acceptable, if the failure was productive (i.e. lessons were drawn)". Learning from failures can be important for improving future innovations and creating an innovation culture that accepts appropriate risks.

The two questions on problem-solving cover the respondent's involvement of students and solving problems in a way that is "appropriate to the task at hand".

Approaches to innovation in teaching and learning

The eight sub-questions for teachers in question 1.7 cover creativity in teaching and learning, for instance by using "different teaching methods", encouraging "students to explore new approaches to assignments and problems", and "innovative teaching". Creative problem-solving does not necessarily lead to innovation, but it is an enabling factor. Creativity implies coming up with new and ideas and solutions or connecting different concepts. The module version for students asks several questions on their creativity and use of critical thinking.

The module for school leaders does not cover creativity. Instead, it includes four sub-questions that ask about the ability of the school to absorb external innovations and develop internal innovations. These questions should be evaluated in combination with data on the teachers' perspective on the school's innovation culture, which is expected to influence both external and internal innovation activities.

Innovation in practice

Question 1.8 uses six sub-questions in the version for teachers to assess the current environment for innovation at the school. The sub-questions include attitudinal questions ("I prefer to do things the way I have always done them"), beliefs about the status quo at school ("current practices at this school are good enough"), and collaboration practices ("We work collaboratively across the school to develop and implement new pedagogical practices"). These sub-questions are designed to develop an innovation profile of both responding teachers and school leaders, who are asked similar questions. A willingness to change practices is particularly important for school leaders, as their attitudes are likely to affect their school's innovation culture.

Collaboration across the school helps to diffuse knowledge about existing practices and solutions, but also ensures that different perspectives are included. The version of the module for school leaders asks for their agreement with the statement "I exchange information with managers at other schools about their practices". External knowledge sharing among school leaders is valuable for the diffusion of quality innovations between schools and identifying problems and how to solve them.

References

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [1]

Osborne, S., M. Cucciniello, G. Nasi and K. Strokocsh (2021), "New development: Strategic user orientation in public services delivery—the missing link in the strategic trinity?", *Public Money & Management*, Vol. 41/2, pp. 172-175, https://doi.org/10.1080/09540962.2020.1758401. [4]

Osborne, S., Z. Radnor and K. Strokosch (2016), "Co-Production and the Co-Creation of Value in Public Services: A suitable case for treatment?", *Public Management Review*, Vol. 18/5, pp. 639-653, https://doi.org/10.1080/14719037.2015.1111927. [3]

Vincent-Lancrin, S., C. González-Sancho, M. Bouckaert, F. de Luca, M. Fernández-Barrerra, G. Jacotin, J. Urgel and Q. Vidal (2019), *Fostering Students' Creativity and Critical Thinking: What it Means in School*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/62212c37-en. [2]

Annex 4.A. Innovation culture module for school leaders

Description

This is a module with questions around innovation culture at [schools]. Its purpose is to help promote self-reflection within a [school] around its processes and culture to support innovative activities. Its main aim is to gather information about the strengths and weaknesses of your innovation culture, and serve as a first step to internal discourse or efforts to improve your [school]'s innovation culture. This module could be implemented as part of [school] self-reflection surveys (such as the SELFIE survey developed by the European Commission).

This version is specific to "[SCHOOL LEADERS]". Please answer specifically to the campus or part of the [school] you are responsible for. If you are responsible for multiple campuses, the entire [school], and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the [school] leader, student, and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context.

Definitions

Terminology	Definition
Innovation	An innovation is a new or improved product or process (or combination thereof) that differs significantly from the [school]'s previous products or processes and that has been made available to potential users (product) or brought into use by the [school] (process). (OECD/Eurostat, 2018[1])
Innovation activities	[Schools] can undertake a series of actions with the intention to develop innovations. This can require dedicated resources and engagement in specific activities, including policies, processes and procedures. See also *Innovation activities (business).* (OECD/Eurostat, 2018[1])
Staff	Staff is defined as any employee of the [school]

MANSTR. 1.1 Do you agree with the following statements about leadership and management strategies at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I take an active role in developing and implementing innovations	☐	☐	☐	☐	☐
b. My [school]'s strategy on innovating or improving on current practices is built around the knowledge and skills of the whole staff, not just a select group	☐	☐	☐	☐	☐
c. [School] leadership clearly defines its vision of how advocated changes will lead to the improvement of educational outcomes	☐	☐	☐	☐	☐
d. [School] leadership empowers staff to innovate	☐	☐	☐	☐	☐
e. [School] leadership encourages students to propose innovations at this [school]	☐	☐	☐	☐	☐
f. There is a dedicated team(s) working on innovation in this [school] with representation of all key stakeholders (i.e. teaching staff, administrative staff, students, [school] leaders).	☐	☐	☐	☐	☐
g. Teaching staff take on leadership positions in the innovation process in this [school]	☐	☐	☐	☐	☐
h. [School] leaders take new/relevant ideas and proposals seriously regardless of their source	☐	☐	☐	☐	☐

EXTINP. 1.2 How would you evaluate your [school] when it comes to how it approaches the process of innovation?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. The [school] ensures all teaching staff have the financial resources and time to participate in continuous professional development and learning (CPLD) to learn about new practices in education	☐	☐	☐	☐	☐
b. My staff is rewarded for experimenting with or improving on current practices in their job (e.g. recognition, job benefits, financial rewards, etc)	☐	☐	☐	☐	☐
c. Staff can get the resources (time and financial) they need for trying out new practices	☐	☐	☐	☐	☐
d. My [school] entered an innovation in a relevant education innovation award competition at least once within the last two years	☐	☐	☐	☐	☐
e. This [school] has good processes in place for encouraging and developing innovative ideas	☐	☐	☐	☐	☐
f. In this [school], there is a lively and active flow of ideas and knowledge	☐	☐	☐	☐	☐
g. In this [school], new ideas and knowledge must be based on strong evidence to be tried out	☐	☐	☐	☐	☐
h. Staff receive feedback for every innovative idea they suggest	☐	☐	☐	☐	☐
i. Staff receive feedback for every innovative practice they implement	☐	☐	☐	☐	☐
j. In this [school], students are considered partners in change	☐	☐	☐	☐	☐

SHASTA. 1.3 What share of your staff:

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes.

Innovation activities are actions taken with the intention to develop innovations.

	0%	Less than 25%	25% to 50%	50% to 75%	75% or more	Don't know
a. Is involved with collaborative projects with other [schools] on innovation in education	☐	☐	☐	☐	☐	☐
b. Thinks of new ideas for innovative activities or materials every year	☐	☐	☐	☐	☐	☐
c. Has the skills to develop innovative activities or materials	☐	☐	☐	☐	☐	☐
d. Has adopted new practices into their daily work within the last year	☐	☐	☐	☐	☐	☐
e. Participates at least once a year in conferences on new practices in pedagogy, teaching and learning	☐	☐	☐	☐	☐	☐

SCOINO. 1.4 How important are the following factors in constraining your ability to innovate?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Very important	Somewhat important	Not important	Don't know
a. External (e.g. governmental) regulations or practices	☐	☐	☐	☐
b. Internal (e.g. [school]) regulations or practices	☐	☐	☐	☐
c. The social context (e.g. the support in the community or society for innovation in general or specific innovations)	☐	☐	☐	☐
d. The ability to change (elements of) the curriculum, assessments or pedagogy	☐	☐	☐	☐
e. Lack of resources	☐	☐	☐	☐
f. High staff turnover	☐	☐	☐	☐

EMPAMO. 1.5 Please indicate whether you feel the following statements apply to your work.

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. A dedicated person (or persons) in this [school] has the time, resources, and responsibility to help staff experiment with or implement innovations	☐	☐	☐	☐	☐
b. A dedicated person (or persons) in this [school] is responsible for applying for funding to experiment with or implement innovations	☐	☐	☐	☐	☐
c. Staff is involved in the design or planning of innovations	☐	☐	☐	☐	☐

d. Students are involved in the design or planning of innovations	☐	☐	☐	☐	☐
e. Parents/guardians are involved in the design or planning of innovations	☐	☐	☐	☐	☐

WOVAST. 1.6 How would you evaluate the following work styles and values at your educational [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. Staff generally solve problems in new and appropriate ways	☐	☐	☐	☐	☐
b. I generally involve students in the problem analysis and/or proposal of solutions	☐	☐	☐	☐	☐
c. This [school] has a positive attitude towards taking measured risks when innovating	☐	☐	☐	☐	☐
d. Failure is acceptable if the failure was productive (i.e. lessons were drawn)	☐	☐	☐	☐	☐

TEACUL. 1.7 To what extent are the following things true when it comes to working on innovation at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. This [school] is strong at absorbing external innovations	☐	☐	☐	☐	☐
b. This [school] is strong at developing its innovations internally	☐	☐	☐	☐	☐
c. Current practices at this [school] are good enough	☐	☐	☐	☐	☐
d. We work collaboratively across the [school] to develop and implement new practices	☐	☐	☐	☐	☐

PERINN. 1.8 To what extent are the following things true about your personal innovation work at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I prefer to do things the way I have always done them	☐	☐	☐	☐	☐
b. I know how to improve administrative and [school] processes	☐	☐	☐	☐	☐
c. The current work environment is conducive to my ability to innovate	☐	☐	☐	☐	☐
d. I exchange information with managers at other [schools] about their practices	☐	☐	☐	☐	☐

Annex 4.B. Innovation culture module for teaching staff

Description

This is a module with questions around innovation culture at [schools]. Its purpose is to help promote self-reflection within a [school] around its processes and culture to support innovative activities. Its main aim is to gather information about the strengths and weaknesses of your innovation culture, and serve as a first step to internal discourse or efforts to improve your [school]'s innovation culture. This module could be implemented as part of [school] self-reflection surveys (such as the SELFIE survey developed by the European Commission).

This version is specific to "TEACHING STAFF". Please answer specifically to the campus or part of the [school] where you teach. If you teach at multiple campuses and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the [school] leader, student, and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context.

Definitions

Terminology	Definition
Innovation	An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). (OECD/Eurostat, 2018[1])
Innovation activities	Institutional units can undertake a series of actions with the intention to develop innovations. This can require dedicated resources and engagement in specific activities, including policies, processes and procedures. See also *Innovation activities (business).* (OECD/Eurostat, 2018[1])
Creativity	Creativity means coming up with new ideas and solutions. It entails: Making connections to other concepts and knowledge from the same or other disciplines; Generating and playing with unusual or radical ideas; Producing, performing, or envisioning a meaningful output that is personally novel; Reflecting on the novelty of the solution and its possible consequences
Critical thinking skills	Critical thinking means questioning and evaluating ideas and solutions. It entails: • Identifying and questioning assumptions and generally accepted ideas or practices; • Considering several perspectives on a problem based on different assumptions; • Being able to consider other theories and perspectives.
Staff	Staff is defined as any employee of the [school]

MANSTR. 1.1 Do you agree with the following statements about leadership and management strategies at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. Leaders at my [school] take an active role in developing and implementing innovations	☐	☐	☐	☐	☐
b. Leaders at my [school] clearly define their vision of how the advocated changes will lead to the improvement of certain educational outcomes	☐	☐	☐	☐	☐
c. Leaders at my [school] empower staff to innovate	☐	☐	☐	☐	☐
d. Leaders at my [school] encourage students to propose innovations at this school	☐	☐	☐	☐	☐
e. Leaders at my [school] give teaching staff leadership positions in the innovation process	☐	☐	☐	☐	☐
f. Leaders at my [school] take new/relevant ideas and proposals seriously regardless of their source	☐	☐	☐	☐	☐

EXTINP 1.2 How would you evaluate your [school] when it comes to how it approaches the process of innovation?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. The [school] ensures I have the financial resources and time to participate in continuous professional development and learning (CPLD) to learn about new practices in education	☐	☐	☐	☐	☐
b. I am rewarded for experimenting with or improving on current practices in my job (e.g. recognition, job benefits, financial rewards, etc)	☐	☐	☐	☐	☐
c. I can get the resources (time and financial) I need to try out new practices	☐	☐	☐	☐	☐
d. I participate at least once a year in conferences on new practices in pedagogy, teaching and learning	☐	☐	☐	☐	☐
e. This [school] has good processes in place for encouraging and developing innovative ideas	☐	☐	☐	☐	☐
f. In this [school], there is a lively and active flow of ideas and knowledge	☐	☐	☐	☐	☐
g. In this [school], new ideas and knowledge must be based on strong evidence to be tried out	☐	☐	☐	☐	☐
h. I receive feedback for every innovative idea I suggest	☐	☐	☐	☐	☐
i. I receive feedback for every innovative practice I implement	☐	☐	☐	☐	☐
j. In this [school], students are considered partners in change	☐	☐	☐	☐	☐

INOPRA 1.3 To what extent do you agree with the following statements about your involvement in innovation?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes.

Innovation activities are actions taken with the intention to develop innovations.

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
a. I am involved with collaborative projects with other [schools] on innovation in education	☐	☐	☐	☐	☐
b. I think of new ideas for innovation activities or materials every year	☐	☐	☐	☐	☐
c. I have the skills I need to develop innovative activities or materials	☐	☐	☐	☐	☐
d. Participating in innovation activities develops my professional skills	☐	☐	☐	☐	☐
e. I have adopted new practices into my daily work within the last year	☐	☐	☐	☐	☐

SCOINO. 1.4 How important are the following factors in constraining your ability to innovate in your job?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Not important	Somewhat important	Very important	Don't know/not relevant
a. External (e.g. governmental) regulations or practices	☐	☐	☐	☐
b. Internal (e.g. [school]) regulations or practices	☐	☐	☐	☐
c. The social context (e.g. the support in the community or society for innovation in general or specific innovations)	☐	☐	☐	☐
d. My skills to develop innovative materials and activities (curriculum, assessments or pedagogy)	☐	☐	☐	☐
e. Lack of resources	☐	☐	☐	☐
f. Frequent turnover of [school] leaders	☐	☐	☐	☐

EMPAMO 1.5 Please indicate whether you feel the following statements apply to your [school].

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. A dedicated person in this [school] has the time, resources and responsibility to help staff experiment with or implement innovations	☐	☐	☐	☐	☐
b. A dedicated person in this [school] is responsible for applying for funding to experiment with or implement innovations	☐	☐	☐	☐	☐
c. [Teachers] are involved in the design or planning of innovations	☐	☐	☐	☐	☐
d. Students are involved in the design or planning of innovations	☐	☐	☐	☐	☐
e. Parents/guardians are involved in the design or planning of innovations	☐	☐	☐	☐	☐

WOVAST. 1.6 How would you evaluate the following work styles and values at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I generally solve problems in new ways that seem appropriate to the task at hand	☐	☐	☐	☐	☐
b. I generally involve students in the problem analysis and/or proposal of solutions	☐	☐	☐	☐	☐
b. I think it is important to take measured risks to improve teaching and learning	☐	☐	☐	☐	☐
c. Failure is acceptable if the failure was productive (i.e. lessons were drawn)	☐	☐	☐	☐	☐

FLALRC. 1.7 To what extent do you agree with these statements around teaching and learning?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I encourage students to explore new approaches to assignments or problems	☐	☐	☐	☐	☐
b. I encourage students to explore different kinds of study methods	☐	☐	☐	☐	☐
c. I use different teaching methods (e.g. by explaining things in different ways or using different mediums to do so)	☐	☐	☐	☐	☐
d. Innovative teaching helps students develop their creativity	☐	☐	☐	☐	☐
e. Innovative teaching helps students develop their critical thinking	☐	☐	☐	☐	☐
f. I know how to improve my teaching methods	☐	☐	☐	☐	☐
g. I believe the practices I currently use in my teaching are good enough	☐	☐	☐	☐	☐

TEACUL. 1.8 To what extent are the following things true when it comes to working on innovation at your [school]?

An innovation is a new or improved product or process that differs significantly from the [school]'s previous products or processes

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I prefer to do things the way I have always done them	☐	☐	☐	☐	☐
b. The current work environment is conducive to my ability to innovate in my teaching	☐	☐	☐	☐	☐

c. We work collaboratively across the [school] to develop and implement new pedagogical practices	☐	☐	☐	☐	☐
d. Current practices at this [school] are good enough	☐	☐	☐	☐	☐
e. I exchange information with my colleagues about the teaching and learning methods we use	☐	☐	☐	☐	☐
f. I have mentored other teaching staff (internally or externally) about how to develop or adopt new practices in the last year.	☐	☐	☐	☐	☐

Annex 4.C. Innovation culture module for students

Description

This is a module with questions around innovation culture at [school]. Its purpose is to help promote self-reflection within a [school] around its processes and culture to support innovative activities. Its main aim is to gather information about the strengths and weaknesses of your innovation culture, and serve as a first step to internal discourse or efforts to improve your [school]'s innovation culture. This module could be implemented as part of [school] self-reflection surveys (such as of the SELFIE survey from developed by the European Commission).

This version is specific to "STUDENTS'. The data collected in this survey is treated confidentially. Data from the [school] leader, student, and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context.

Module questions

AGEGRP 1.1 What year of study are you in?

Year: _____

MANSTR. 1.2 Do you agree with the following statements about your [school]?

School leaders mean the principal, dean, or others that may be in charge at your [school].

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. [School] leaders encourage students to propose new ways of doing things in my [school]	☐	☐	☐	☐	☐
b. This [school] often changes how it does things (in the classroom and outside of the classroom)	☐	☐	☐	☐	☐
c. Students are asked to test or share their opinions on new solutions throughout the process of changing things at the [school] – not just at the end.	☐	☐	☐	☐	☐
d. If I come up with a new idea about changing what or how to learn, teaching staff will take my idea seriously	☐	☐	☐	☐	☐
e. If I come up with an idea about changing [school] rules or actions, [teachers] and [school] leaders will take my idea seriously	☐	☐	☐	☐	☐
f. If I come to [teachers] and [school] leaders with a problem or issue, they take my report seriously	☐	☐	☐	☐	☐

EXTINP 1.3 How well do you think the following types of communication around new ideas work at your [school]?

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I know who to talk to or what to do if I want to propose a new idea to change things in my [class] or in the [school]	☐	☐	☐	☐	☐
b. It is easy to talk to teaching staff or [school] leaders about your ideas on how to improve teaching, learning or [school] life	☐	☐	☐	☐	☐
c. I would never dare to propose a new idea to change anything in the [school] or in my [classes]	☐	☐	☐	☐	☐

NEWIDE 1.4 Do the following statements apply to you when thinking about new ideas for your [school]?

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. I have been part of groups with [teachers] or [school] leaders where we think about new ideas at my [school]	☐	☐	☐	☐	☐
b. I know students who are involved in the design or planning of new ideas with [teachers] or school leaders	☐	☐	☐	☐	☐
c. I get to share my opinion on new projects or plans at my [school] with [teachers] or [school] leaders	☐	☐	☐	☐	☐
d. I have been asked to share my ideas about how to put in place new ideas/practices at my [school] with [teachers] or [school] leaders	☐	☐	☐	☐	☐
e. I have many ideas about how to change things at my [school]	☐	☐	☐	☐	☐
f. My [teachers] have responded to suggestions from me or other students in the [class] to change how they teach	☐	☐	☐	☐	☐
g. When something changes at my [school], the [school] lets my parents/custodians and I know	☐	☐	☐	☐	☐

WOVAST 1.5 Do you agree or disagree with the following statements about your work for [school] (both in and out of class, including homework)?

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. I like to solve problems in new ways that seem to fit the task	☐	☐	☐	☐	☐
b. I take some risks with the way I do assignments or homework	☐	☐	☐	☐	☐
c. [Teachers] find it is ok for me to make mistakes, as long as I have learnt from them.	☐	☐	☐	☐	☐
d. [Teachers] reward me for having new ideas or new ways to do my [school] work	☐	☐	☐	☐	☐
e. I prefer to do things the way I have always done them	☐	☐	☐	☐	☐
f. I would love to be more creative or critical in my [school] work, but [teachers] expect us to just repeat what they said *Creativity means coming up with new ideas and solutions* *Critical thinking means questioning and evaluating ideas and solutions*	☐	☐	☐	☐	☐
g. I exchange information with other students about the learning and study methods we use	☐	☐	☐	☐	☐

FLALRC 1.6 Do you agree or disagree with the following statement about your [classes]?

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
a. My [teacher] encourages me to try new ways to do assignments or solve problems in the course	☐	☐	☐	☐	☐
b. My [teacher] encourages me to try different kinds of learning methods	☐	☐	☐	☐	☐
c. My [teacher] uses different ways to explain things to help students understand the topic	☐	☐	☐	☐	☐
d. I am learning how to be more creative at this [school] *Creativity means coming up with new ideas and solutions*	☐	☐	☐	☐	☐
e. I am learning how to think more critically at this [school] *Critical thinking means questioning and evaluating ideas and solutions*	☐	☐	☐	☐	☐

5 Educational innovation towards equity: Self-reflection questionnaire and workshop

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This chapter commences with an explanation of the purpose of the self-reflection survey on educational innovation towards equity, the different versions of the questionnaire, and the scope and meaning of equity in this context. The outline and sections of the questionnaires are then discussed, with explanations of the questions and items which are part of the survey, why they are included as well as their response categories. As a self-reflection instrument, the administration of the questionnaires is meant to be followed by a workshop involving all categories of stakeholders who took part in the survey. The self-reflection questionnaires are included in Annex 5.A, Annex 5.B, Annex 5.C, Annex 5.D and the workshop is included as Annex 5.E.

Introduction

The questionnaire on innovation towards equity is designed for secondary schools and higher education institutions to collect data for self-reflection on innovation activities of relevance to equity, but the questions could be adapted for other goals.

There are four questionnaires aimed at school (or university) leaders, teachers, secondary school students, and higher education students. The idea is to administer the questionnaires within a high school or a tertiary education institution to three different stakeholders: institutional leaders, teachers and students. Following this data collection, the results of the data collection should be discussed during a workshop aimed at preparing an action plan for further innovation or improvement. All versions of the questionnaires begin with a short description of the purpose and scope of the survey. Equity in education and other key terms are defined in an annex, but many terms are briefly defined where they appear in the questionnaire, such as 'students with special educational needs' and "low socio-economic status students".

Equity in education is about giving students with different disadvantages the opportunities to succeed to the same extent as their more advantaged peers. Disadvantages can come from socio-economic status, gender, migrant background, minority ethnic group, sexual orientation (LGBTQI+), national minorities, indigenous backgrounds, giftedness, and special educational needs (further divided into learning disabilities, mental disorders, and physical impairments). Lastly, student well-being is defined and divided into academic, material, physical, psychological, and social well-being. Equity thus covers inclusion and (lack of) bullying.

The summary of the questionnaire below focuses on the version of the questionnaire for teachers, which is similar to the questionnaire for school leaders. There are more differences with the two versions for students. A common difference for both student versions is that all questions are formulated to reflect the position of students. The version for higher education students does not include some questions on evaluation or administrative issues, but includes questions on how students are consulted about changes, detailed questions on bullying and harassment, on class discussion of equity issues, which are not included in the version for teachers. The version for secondary school students is considerably shorter (11 pages instead of 15 pages for higher education students and 16 pages for teachers) and covers consultation, disciplinary actions, and bullying, in addition to some questions on the practices in use in the school.

The questionnaire uses several types of response categories. The most common is ordinal importance scales, but a few questions use yes or no categories or check lists.

In addition to describing the structure of the questionnaire, this introductory chapter includes a discussion of a post-survey workshop on equity. It is indeed recommended that a workshop allowing for individual and collective reflection – and hopefully action ultimately – follows answering those types of questionnaires. The individual self-reflection can thus generative collective reflection and the design of an innovation action plan for the institution to improve its practices to support educational equity.

Questionnaire structure

The questionnaire contains three main parts: Part 1 includes seven questions on innovation needs and diagnosis, Part 2 includes six questions on practices, and Part 3 on inclusive education contains four questions. A short final section uses two questions to collect general information. The unit of analysis is mainly equity *within the establishment where the questionnaire is administered* (rather than equity at the system level).

Part 1: Innovation needs and diagnosis

Question 1.1 of Part 1 contains eight sub-questions that ask about the importance of reasons to improve equity in the respondent's school. The purpose is to identify the needs for possible future innovation and improvements to achieve more equity. The goals include increasing student performance, addressing concerns of parents/guardians, closing achievement gaps, promoting equity for disadvantaged students, meeting national targets, addressing safety, and contributing to a more equal society.

Question 1.2 uses check lists to identify the three types of students, out of ten types, that "require the most support to improve educational equity in the next two years". The self-reflection goal is to open an internal discussion within the school on which groups to focus on for high-impact or priority innovations.

Question 1.3 asks respondents to rate the importance of new practices in ten areas for improving educational equity in the educational institution. The practices cover teaching and learning, assessment, admission policy, discipline and expulsion policy, class composition, communication with students and parents, student support programmes, work responsibilities or communication among staff, and school facilities or infrastructure. Many of these practices can be linked to equity. For example, teaching, learning and assessment practices directly affect student academic performance and are the central tasks performed by schools. Differentiated strategies might be one way to close the achievement gap between students. Admissions, discipline, and expulsion policies are particularly relevant to equity in education. Selection processes and discipline and expulsion policies can discriminate against disadvantaged students or those with minority ethnic backgrounds (Skiba et al., 2011[1]). Effectively organising work responsibilities or communication among staff is a key mechanism to identify students facing or developing problems of any kind and ensure that staff intervene. School facilities or infrastructure provide opportunities to incorporate facilities to support specific groups of students.

Question 1.4 asks about changes in the previous two years to improve educational equity in the identical list of ten areas covered in question 1.3. The purpose is to determine if changes have been made, and the degree of change, to address identified areas where new practices are needed.

Question 1.5 asks respondents, on a "yes" or "no" basis, if they have "personally introduced new teaching and learning practices to improve educational equity." The question covers six practices, including new approaches to assignments or problems, developing creativity or critical thinking, and collaborative class projects.

For respondents that previously reported changes in their own or their educational institution's practices, question 1.6 asks if nine equity outcomes have improved due to new practices. The outcomes include student well-being, school safety, academic outcomes, inclusive learning, dropout rates, etc. These factors can significantly affect students in ways that also influence academic performance. For example, students with higher levels of well-being tend to have better self-esteem, more satisfaction with their schools and life, and healthier relationships with others (OECD, 2017[2]; Park, 2004[3]). If students believe their school environment is safe, schools have fewer discipline problems, which improves academic achievement (Brackett et al., 2011[4]; Murkuria, 2002[5]; Way, 2011[6]; Raffaele Mendez, Knoff and Ferron, 2002[7]).

Question 1.7 asks about the importance of six methods for evaluating the effect of new solutions for educational equity at their school. The evaluation methods include the use of key performance indicators, internal and external evaluation, and feedback from teachers, parents/guardians, or students. Evaluation is essential to ensure that a solution works and to identify areas that need improvement, while feedback can gain insights that are difficult to identify through key performance indicators or evaluation.

Part 2: Practices

The purpose of Part 2 is to raise self-reflection on the importance of specific practices to improve equality of opportunities and is divided into five topics, each of which is addressed by one question.

Question 2 covers the current use and expected future use of nine teaching and learning practices, many of which focus on personalised teaching methods that are appropriate for the needs of different students. These include personalised learning materials, individual learning plans, diversity-conscious learning materials, individual and group tutoring, and experiential learning.

Question 3 asks about the respondent's expectations for the effect of equity on changing six school administrative practices for admission, discipline, expulsion, dropout interventions, student performance tracking, and promotion of diversity in teaching staff. Administrative practices can have a large effect on equity as they determine who can enrol in the educational institution, why students are disciplined or expelled and for how long and whether some students are more likely to be disciplined than others.

Question 4 asks about the effect on equity of changing ten services or activities to support students and their well-being. The services include guidance and counselling, loans, nutrition, and funding for extra activities. All of these services can improve equity, although the focus is on support for students from low-income families. Counselling services can help students struggling with school transitions, bullying, home situations, or other well-being concerns – all of which are key contributors to students dropping out or underperforming. Other activities include school projects on minority cultures, prevention of bullying and discriminatory behaviour, engagement with parents/guardians, and projects with the school's community. These activities can enrich and diversify learning experiences and prevent (or diminish) bullying and discriminatory behaviours. Projects that aid in the understanding of different identities can foster understanding by other students and reduce social distance, out-group bias and help to create an inclusive learning environment (Allport, 1954[8]; Abrams, 2010[9]). Engagement with parents/guardians and the educational institution's external community can obtain broader support to reduce bullying and discrimination.

Question 5 asks about the importance of eleven knowledge and learning practices to improve educational equity. The focus is on research, training and learning practices in four areas: school-level knowledge gathering and sharing, collaborations with other schools, sharing information on school practices, and research projects. These activities could make substantial contributions to improving equity by identifying good practices in use in other educational institutions or jurisdictions and improving the expertise of staff. However, as the focus is on research and knowledge sharing, some institutions and teachers could lack the time and resources for full participation in these activities. A desirable outcome for self-reflection is that respondents and their institutions recognise the importance of these activities and invest in them.

Question 6 covers the importance of twelve obstacles to the respondent's ability to innovate to improve educational equity. The obstacles concern resources, skills and knowledge, personal and management motivation (interest), and risks. Obstacles due to resource constraints are common and include a lack of finance, time, and training, all of which can create a lack of motivation (fatigue) to work on new solutions or reforms. Obstacles due to a lack of skills and knowledge affect the ability of individuals in the school to introduce new solutions as effectively as possible. Obstacles from a lack of motivation can affect multiple stakeholders in the educational institution, including management and teaching staff, and also the intended beneficiaries such as students, parents/guardians, and the broader community. A lack of interest by beneficiaries can have a demoralising effect on staff and reduce community political pressure for solutions. Finally, concerns over a "high risk of failure" can be debilitating, particularly if shared by several internal groups within the educational institution (teachers, school leader, administrators).

Part 3: Inclusive education

Part 3 covers facilities and equipment in two questions and has one question on the learning environment for inclusivity. In addition, there is a short question on priorities. Facilities can be an important factor for students with visual or other physical impairments, while specialised equipment can provide significant benefits for students with physical, mental, or learning issues.

Question 7.1 on facilities and equipment asks if three aspects of the institution's physical infrastructure meet the needs of three groups of students: the blind and visually impaired, other physically impaired students, and a general category for students who need quiet spaces for tutoring, mentoring, or space for projects. The questions are measured on a scale (fully, partly and not at all) and include a "not relevant" option.

Question 7.2 asks about the provision of equipment to meet the needs of students with various types of impairments as well as students with other special education needs. The same response options are used as in question 7.1. Each sub-question provides examples of the type of equipment that is relevant, many of which involve software. For instance, the visually impaired can be assisted through using screen magnification software on computers, learning materials in braille, etc. (Good, 2021[10]).

Question 8.1 is a version of an outcome question, asking "to what extent do you think the well-being needs of [ten groups of students] are met at your school?" The presence of an inclusive school environment is reflected through the responses for specific student groups, which include students with special educational needs, a different native language, from ethnic minorities, migrant backgrounds, or of a minority religion; gifted students; students that are socio-economically disadvantaged; LGBTQI+; female, or male. The intention is to cover all groups of interest in the list of student types. It can of course be adapted and made more context specific.

Question 8.2 on priorities asks: "which of the following areas of well-being require more attention at your school?" The areas are academic, physical, material, psychological and social well-being. The reason for separating each of these areas of well-being is to stress the importance of all four types of well-being on the experiences of students. Well-being of all types is important to equity because it has significant impacts on the learning outcomes of students, as well as their progression and graduation rates (Evangelou et al., 2008[11]; Gutman and Vorhaus, 2012[12]). Academic well-being concerns the learning progress of students, as well as actions and behaviours that promote learning. Material well-being addresses the material resources families and institutions have or make available for students' learning and healthy development. Physical well-being encompasses students' health status, safety and security, and ability to interact with each other, whereas psychological well-being revolves around the students' evaluations and views about life, engagement with their educational institution, and extent to which they feel a sense of agency, identity, and empowerment. Lastly, social well-being comprises the quality of students' social lives and their relationships with family, peers, and teachers. None of these areas can be fully addressed by school programmes alone, but ensuring that well-being programmes touch on all these areas increases the chance that issues are identified, mitigated, or avoided.

Final section: General information

With respect to self-reflection, this section is mainly relevant to a possible statistical analysis of the responses, including providing quantitative benchmarks to respondents. Indeed, even a self-reflection questionnaire can be turned into statistical information (if implemented with a probability sample). The first question collects data on the current professional role of the respondent, which can be teaching, teaching assistant, administrative employee, or other for schools. The questionnaire for the tertiary education sector follows the hierarchy of professors plus includes categories for teaching assistant, administrators, and other. The second question is open and asks for the number of years the respondent has worked in education, since experience can be positively correlated with professional competences (OECD, 2018[13]).

For comparative analysis, it is necessary to collect other data on the educational institution. This information can be collected from public sources or from the survey of institutional leaders. Relevant data include the number of employees and students in the institution, since larger institutions have more resources which could influence the capacity to innovate (OECD/Eurostat, 2018[14]). The teacher-to-student ratio can affect the amount of time teaching staff have to innovate and is another indicator of institutional resources.

The last question in this general section in the institution leader survey asks respondents to estimate the share of students with seven characteristics: students from ethnic minority or indigenous backgrounds, minority language students, socio-economically disadvantaged students, students from a migrant background, students with learning disabilities, students with physical impairments, and students with mental disorders. This question includes most categories of disadvantaged students. Gender is not included, as most schools would hover around 50% of both sexes or 100% of a single sex, and schools are unlikely to have data on students who identify with other genders. Similarly, the share of gifted students could be similar across many schools, although schools may fail to recognise gifted students who also fall in a traditionally disadvantaged category. LGBTQI+ identities are proportionally related to the population, so most schools are likely to have comparable shares of students with such identities. Moreover, schools are unlikely to collect this data.

The last question allows for statistical comparisons between schools with similar populations of specific types of disadvantaged students. The response categories are 0%, 1-10%; 11-30%; 31-60%; >60%; and don't know.

Workshop

The self-reflection survey on equity collects the views of stakeholders within an institution about the areas for improvement, practices that could enhance equity, and the current situation around equity for various student groups. The survey thus mixes queries on innovation with reflections on equity. The goal is that answering the questionnaire would provide respondents with insights on where different stakeholders feel the most action is needed, and potentially present the school with practices that could contribute to improved equity. However, how these new solutions should best be carried out is neither addressed nor suitable for this questionnaire. These and other issues could appropriately be discussed in a workshop that builds on the questionnaire. The workshop is designed to include school leaders, teaching and administrative staff, and students; all of whom are important sources of information. Their participation would also increase "buy in" for solutions that the school decides to pursue.

Primarily, the workshop provides an opportunity to have a structured discussion about the insights derived from the survey and about potential avenues to delve deeper into root causes, brainstorm on areas and pathways for improvement, and formulate plans to exact change. Additionally, the workshop provides an opportunity to have an open discussion with school stakeholders and to engage them in equity issues, one of the major challenges in education. The proposed workshop would require about half a day. Educational institutions or researchers are free to adapt content as they see fit and delve more deeply into areas of interest to them.

Workshop content

The workshop document consists of two sections, the first outlines organisational considerations and the second covers the content of the workshop.

Organisation

The section on the organisation of the workshop focuses on the facilitation and context. Although not always necessary, facilitation can help if discussion groups have questions or require more active guidance. Since the goal is to have students and teachers participate, the session should be planned at a time that does not conflict with exams or other busy times for students, staff, or school leaders and which also offers an opportunity for parents and students to attend. It is important that a concerted effort is made to involve a diverse set of participants from all stakeholder groups. Organisers could invite people they

might consider helpful to create such a diversity of views, but open-access participation is favoured as a general approach.

Workshop

The workshop content is divided into three sections: the introduction, activities, and guidance for ongoing activities after the workshop.

The *introduction* includes icebreakers and a presentation on the context of the workshop. Depending on the familiarity of the workshop participants with each other, organisers could choose icebreakers that are personal or more focused on expectations and views with respect to the workshop content. It is important that participants get to know each other so they feel confident sharing opinions. The idea exchange will work best when it is made explicit that all (respectful) opinions are valid, no matter their source. A sense of who every participant is and why they have joined the workshop will help foster such an environment. The presentation on the context should include information about the purpose of the survey and workshop and the goals from the institution's perspective. Moreover, the context could benefit from a presentation of the results from the self-reflection survey. These results should mainly focus on average results, but it might be useful to highlight surprising outliers. The context should help frame the discussion for participants, many of whom may have completed the questionnaire but be unaware of the institution's goals for the survey.

The *activities* include a brainstorming session, a practical discussion session, and a plenary session. Participants should be divided into groups of 5 to 7 individuals, which is large enough to generate a discussion, but not so large that certain members get lost in the mix. Group work also fosters a collaborative mindset and constructive discussions necessary for the workshop. The groups for the brainstorming session should be among similar individuals (e.g. teachers only), and formed based on interest. The groups for the discussion session should include representation from all stakeholder groups and be based around interests as well.

The first activity is a brainstorming session of one hour on two or three topics to collect a range of ideas or solutions that can be discussed in-depth during the second activity. The topics are the same as the themes covered in the survey and include:

1. Main achievements of the school around improving equity
2. Teaching staff support for disadvantaged students
3. The role of administrative practices in equity
4. Student support practices to improve equity
5. Knowledge sharing and learning practices for equity
6. Overcoming obstacles to improving equity
7. Possible improvements to facilities, space usage or software
8. The process of introducing changes to improve equity
9. Well-being of disadvantaged students

Of these topic areas, items 5 and 6 are less relevant for students, and therefore, depending on the context, student participation could be limited to the other themes.

The list of suggestions resulting from the brainstorming provides the input for the next activity, which revolves around a practical discussion of the suggestions provided in the first activity. These suggestions can be tested based on the resources needed, the processes required for successful implementation, and the timeline these ideas could be implemented in. The first topic from the brainstorming sessions does not need to be covered in the practical discussions, leaving eight topics. Each group should generally cover

one topic, as this will allow them to get through as much of the suggestions from the brainstorming session as possible.

The workshop is then to be wrapped up with a plenary discussion. Participant groups can give a brief overview of the results of their practical discussions by detailing two ideas and/or provide main takeaways. This should be followed by a general discussion about workshop results, such as what participants have learnt, whether participants would like to continue working on this topic, and what, in their opinion, is needed to improve equity. It is important to create a sense of ownership over the process and progress of this work among participants, as their involvement in innovations around equity will determine the success and extent to which change is accomplished. The conclusions and next steps should include a description of what the institution would like to do with the results and how they will take the work forward. There should be a discussion about the process, such as whether participants liked the format, or if they feel anything should be changed for potential future workshops. The written work of the workshop participants should be collected and processed by the administrators after the workshop is finished.

Guidance for ongoing activities

Notes or observations from overseeing the activities of the workshops should be combined with the notes from participants. The key is to get a good grasp of the proposals coming out of the discussions. What were main points of agreement and disagreement among participants? Were there any differences between different stakeholder groups or different groups of students, staff, and school leaders? Moreover, the considerations of participants with regards to the resources, processes required, and timelines should be main inputs into formulating plans. To what extent can these plans be realised with internal and/or external resources, what is necessary to implement these innovations, what does buy-in appear to look like from the perspective of school stakeholders? How do the proposals from the workshop stack up against the most common problems identified in the survey? How should work around improving equity be progressed at the school?

The school management needs to decide what changes to make and establish an action plan, and the results of the workshop may be one of the main inputs into such a discussion. At the very least, it would be a barometer. Hence, a written summary of the results of the workshop should be produced and sent to participants for comments. The workshop can also be used for research, if observers are present during the workshop to track the proceedings, interactions, and engagement with the activities.

The workshop should also include suggestions for further activities, such as follow-up meetings and workshops to continue the conversation at an institution-wide level or for institutional leadership to receive feedback on their plans or progression of their work. Alternatively, a working group or taskforce can be created that includes some of the workshop participants with the responsibility to carry forward the discussion. This approach can involve a more diverse group of stakeholders in the planning and execution stage of innovations for greater equity in the institution.

References

Abrams, D. (2010), *Processes of prejudice: Theory, evidence and intervention.*, Human Rights: 68., https://www.equalityhumanrights.com/sites/default/files/research-report-56-processes-of-prejudice-theory-evidence-and-intervention.pdf. [9]

Allport, G. (1954), *The nature of prejudice.*, Cambridge, MA: Perseus Books. [8]

Brackett, M., M. R. Reyes, S. E. Rivers, N. A. Elbertson and P. Salovey (2011), "Classroom emotional climate, teacher affiliation, and student conduct.", *Journal of Classroom Interaction*, Vol. 46/1, pp. 27–36, http://eric.ed.gov/?id=EJ948647. [4]

Evangelou, M., B. Taggart, K. Sylva, E. Melhuish, P. Sammons and I. Siraj-Blatchford (2008), *What Makes a Successful Transition from Primary to Secondary School? Effective Pre-school, Primary and Secondary Education 3-14 Project (EPPSE 3-14).*, https://dera.ioe.ac.uk/8618/1/DCSF-RR019.pdf. [11]

Good, J. (2021), "Serving students with special needs better: How digital technology can help", in *OECD Digital Education Outlook 2021. Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, OECD, https://doi.org/10.1787/589b283f-en. [10]

Gutman, L. and J. Vorhaus (2012), *The Impact of Pupil Behaviour and Wellbeing on Educational Outcomes.*, Department for Education: Childhood Wellbeing Research Centre, United Kingdom, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/219638/DFE-RR253.pdf. [12]

Murkuria, G. (2002), "Disciplinary challenges: How do principals address this dilemma?", *Urban Education*, Vol. 37/3, pp. 432–452, http://eric.ed.gov/?id=EJ660361. [5]

OECD (2018), *Effective Teacher Policies*, OECD, https://doi.org/10.1787/9789264301603-en. [13]

OECD (2017), *PISA 2015 Results (Volume III): Students' Well-Being*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264273856-en. [2]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [14]

Park, N. (2004), "The role of subjective well-being in positive youth development", *The Annals of the American Academy of Political and Social Science*, Vol. 591/1, pp. 25-39. [3]

Raffaele Mendez, L., H. Knoff and J. Ferron (2002), "School demographic variables and out-of school suspension rates: A quantitative and qualitative analysis of a large, ethnically diverse school district.", *Psychology in the Schools*, Vol. 39/3, pp. 259–27. [7]

Skiba, R., R. Horner, C. Chung, M. Karega Raush, S. May and T. Tobin (2011), "Race is not neutral: A national investigation of African American and Latino disproportionality in school discipline", *School Psychology Review*, Vol. 40/1, p. 85. [1]

Way, S. (2011), "School discipline and disruptive classroom behavior: The moderating effects of student perceptions.", *Sociological Quarterly*, Vol. 52/3, pp. 346–375. [6]

Annex 5.A. Self-reflection survey on equity and innovation: Institution leaders

This Annex presents the survey questionnaire to be answered by education institution leaders. The questionnaire can (and should) be adapted to the local context (in line with the adaptation of the other questionnaires targeting other stakeholders in the institution). Some terms will need to be changed depending on whether it is administered in secondary education schools or higher education institutions. The scope of the inequity issues can be adapted, although it is better to keep it as broad as possible.

Description

This is an innovation survey specifically targeted at [schools]. Its purpose is to collect help promote self-reflection around how new solutions affect equity at this [school], and how this [school] uses new solutions to improve equity. This version is specific to "[SCHOOL LEADERS]". Please answer specifically to the campus or part of the [school] you are responsible for. If you are responsible for multiple campuses, the entire [school], and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the school leader and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context. Definitions or concepts may need to be altered to fit country contexts.

Terminology	Definition
Equity in education	Equity in education means that the achievement of educational potential in a [school] is not the result of personal and social circumstances, including factors such as gender, ethnic origin, immigrant status, special education needs and giftedness. Equity can be achieved both at the [school] level and system level, but given this is a [school] survey, ensuring equitable achievement of educational potential in the institution is the key focus of this concept.

PART I - Diagnosis

1. Innovation need and diagnosis

[Self-reflection: This section aims to make the respondent reflect on past new solutions targeted to equity, to reflect on how it was targeted on different types of possible beneficiaries of equity practices and to help identify the needs for possible future new solutions and improvement in this area.

Statistics: In case of statistical treatment, this information will provide information about the intensity of past new solutions, perception about its impact and targeted populations. It will also allow to compare some of the responses in this section to responses in the next sections (feedback on areas for improvement and how this could be done).]

1.1 VISSTRA Which of the following are true for the [school]'s vision on improving equity:

	Yes	No	Don't know
a. Improving equity is an objective included in the [school]'s strategy documents	☐	☐	☐
b. Strategy documents are used in internal communication	☐	☐	☐
c. Strategy documents are used in external communication	☐	☐	☐

1.2 MOTINO. How important are the following reasons for you in improving equity at your [school]?

Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Increase the overall student performance	☐	☐	☐	☐
b. Increase the overall student well-being	☐	☐	☐	☐
c. Address the concerns of the external community (e.g. parents/guardians)	☐	☐	☐	☐
d. Close achievement gaps between students at the [school]	☐	☐	☐	☐
e. Close achievement gaps with other [schools]	☐	☐	☐	☐
f. Promote equity for disadvantaged students in areas other than achievement at your [school]	☐	☐	☐	☐
g. Meet national/state targets or regulations	☐	☐	☐	☐
h. Address the safety of disadvantaged students at the [school]	☐	☐	☐	☐
i. Contribute to a more equal society (beyond education)	☐	☐	☐	☐
j. Other: [please describe]				

1.3 TARGETIMP. In your [school], which three groups of students require the most support to improve educational equity in the next two years? (*Please select three of the options below*)

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

For more detailed definitions, see the end of the survey.

a. Students with special educational needs ☐

Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders

b. Students whose primary language is not the language of instruction or a dialect of this/these language(s) ☐

c. Students from minority ethnic groups ☐

A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.

d. Gifted students ☐

Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)

e. Socio-economically disadvantaged students ☐

Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.

f. LGBTQI+ students ☐

g. Students of a particular gender (female- or male-specific gender-related inequalities) ☐

h. Students of minority religions ☐

i. Students from a migrant background ☐

Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they access educational services.

j. Other groups of students: [please describe]

1.4 INNOVDIAG. How important are new practices in the following areas to improve educational equity in your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐	☐
b. Assessment practices	☐	☐	☐	☐
c. Admission policy	☐	☐	☐	☐
d. Discipline and expulsion policy	☐	☐	☐	☐
e. Class composition (including formal/informal tracks and ability groupings)	☐	☐	☐	☐
f. Communication with students and parents/guardians	☐	☐	☐	☐
g. Student support programmes	☐	☐	☐	☐
h. Work responsibilities or communication among staff	☐	☐	☐	☐

i. Collaboration among teaching and non-teaching staff	☐	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐	☐
k. Other (please specify)	☐	☐	☐	☐

1.5 PSTINN. In the past two years, to what extent did your [school] introduce new practices in the following areas in order to improve educational equity:

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Fully	Partly	Not at all	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐	☐
b. Assessment practices	☐	☐	☐	☐
c. Admission policy	☐	☐	☐	☐
d. Discipline and exclusion policy	☐	☐	☐	☐
e. Class composition (including formal/informal tracks and ability groupings)	☐	☐	☐	☐
f. Communication with students and parents/guardians	☐	☐	☐	☐
g. Student support programmes	☐	☐	☐	☐
h. Work responsibilities or communication among teaching staff	☐	☐	☐	☐
i. Collaboration among teaching and non-teaching staff	☐	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐	☐
k. Other (please specify)	☐	☐	☐	☐

1.6 IMPINN. How much have the following outcomes improved due to new practices that your [school] or yourself have introduced (see questions 1.5 and 1.6)? (If you answered "not at all to all options in Q1.5 and Q1.6 please go to question 1.8).

[definitions of these terms are included at the end of the survey]

Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.

	Not at all	Somewhat	A lot	Don't know/not relevant
a. Student well-being	☐	☐	☐	☐
b. Educational equality across socio-economic groups	☐	☐	☐	☐
c. Equality across socio-economic groups in areas other than educational achievement at your [school]	☐	☐	☐	☐

d. Gender equality	☐	☐	☐	☐
e. Educational attainment of disadvantaged students	☐	☐	☐	☐
f. Academic outcomes of disadvantaged students	☐	☐	☐	☐
g. Dropout rates of disadvantaged students	☐	☐	☐	☐
h. Inclusive learning environment	☐	☐	☐	☐
i. A safe [school] environment	☐	☐	☐	☐

1.7 INEVAL How important do you think the following methods are for evaluating new solutions to address educational equity at your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Monitoring through key performance indicators	☐	☐	☐	☐
b. Internal evaluation of the impacts of new solutions	☐	☐	☐	☐
c. Impact evaluation by external stakeholders	☐	☐	☐	☐
d. Feedback from teachers (e.g. surveys, focus groups)	☐	☐	☐	☐
e. Feedback from parents/guardians (e.g. surveys, focus groups)	☐	☐	☐	☐
f. Feedback from students (e.g. surveys, focus groups)	☐	☐	☐	☐

PART II - Practices

2. Support for teaching and learning

[Self-reflection: This section aims to raise awareness of the importance of proposing adapted learning resources, diagnosis assessment, additional support, and customised instruction.

Statistics: In case of statistical treatment, this information will provide information about new pedagogical solutions and areas for future improvement.]

2.1 EFFINC In which of the following areas have you made (and plan to make) a concerted effort to improve educational equity for different groups of students (e.g. students with special educational needs, socio-economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	In the past 2 years			**In the coming year**		
	Yes	No	Don't know	Yes	No	Don't know
a. Personalised learning materials/technology	☐	☐	☐	☐	☐	☐
b. Diagnosis assessments to better tailor support	☐	☐	☐	☐	☐	☐

c. Individualised learning plans	☐	☐	☐	☐	☐	☐
d. More diversity-conscious learning materials	☐	☐	☐	☐	☐	☐
e. Individual tutoring (in or out of school)	☐	☐	☐	☐	☐	☐
f. Group tutoring (in or out of school)	☐	☐	☐	☐	☐	☐
g. In-class teaching aide/assistance	☐	☐	☐	☐	☐	☐
h. Emphasis on experiential or "active" learning	☐	☐	☐	☐	☐	☐
i. Emphasis on memorisation and repeated practice	☐	☐	☐	☐	☐	☐
j. Interdisciplinary/community projects	☐	☐	☐	☐	☐	☐
k. New assessment methods	☐	☐	☐	☐	☐	☐
l. Small group instruction	☐	☐	☐	☐	☐	☐
m. Other (specify)	☐	☐	☐	☐	☐	☐

3. School administrative practices

3.1 ADMPRA Which of the following administrative practices have you changed significantly in the past 2 years (and do you plan to change) in order to improve educational equity?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	In the past 2 years			**In the coming year**		
	Yes	No	Don't know	Yes	No	Don't know
a. Admissions: The proportion of disadvantaged students enrolled (low socio-economic status, etc.)	☐	☐	☐	☐	☐	☐
b. Admissions: Diversity in student characteristics	☐	☐	☐	☐	☐	☐
c. Discipline and code of conduct (e.g. that affect certain groups of students disproportionately or have a negative impact on the academic learning of more disdavantaged students)	☐	☐	☐	☐	☐	☐
d. Expulsion policy (both formal and informal)	☐	☐	☐	☐	☐	☐
e. Interventions to prevent dropouts	☐	☐	☐	☐	☐	☐
f. Tracking of student performance or development within the [school]	☐	☐	☐	☐	☐	☐
g. Promotion of teaching staff diversity (gender, ethnic, religious, etc.)	☐	☐	☐	☐	☐	☐
h. Other (specify)	☐	☐	☐	☐	☐	☐

4. Student support and well-being

4.1 SERINC Which of the following services/practices have changed significantly in the past 2 years (and do you plan to change) in order to improve educational equity for different groups of students in your [school] (e.g. students with special educational needs, socio-economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	In the past 2 years			In the coming year		
	Yes	No	Don't know	Yes	No	Don't know
a. Guidance services (career guidance, study guidance, etc.)	☐	☐	☐	☐	☐	☐
b. Counselling services	☐	☐	☐	☐	☐	☐
c. Nutrition for low socio-economic status students	☐	☐	☐	☐	☐	☐
d. Equipment loans to support students who need it to study at home and access online learning materials	☐	☐	☐	☐	☐	☐
e. Funding to make all [school] activities inclusive regardless of family income	☐	☐	☐	☐	☐	☐
f. School projects related to minority cultures or identities	☐	☐	☐	☐	☐	☐
g. Programmes to prevent and raise awareness of bullying	☐	☐	☐	☐	☐	☐
h. Sensitisation to and prevention of discriminatory behaviours	☐	☐	☐	☐	☐	☐
i. More engagement and communication with parents/guardians of disadvantaged students	☐	☐	☐	☐	☐	☐
j. Projects with communities and actors outside the [school]	☐	☐	☐	☐	☐	☐
k. Other (please specify)	☐	☐	☐	☐	☐	☐

5. Knowledge and innovation practices

5.1 LEPRAC Which of the following knowledge and learning practices were in use in the past 2 years at your [school] to develop the capacity and knowledge to implement the most effective practices to improve educational equity? Which of these knowledge and learning practices do you plan to change significantly in the next year?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	In the past 2 years			In the coming year		
	Yes	No	Don't know	Yes	No	Don't know
a. Dedicated unit to support teaching and learning for students with special education needs	☐	☐	☐	☐	☐	☐
b. Organisation of widely accessible, dedicated training	☐	☐	☐	☐	☐	☐
c. Projects with other [schools]	☐	☐	☐	☐	☐	☐
d. Action-research projects with education researchers	☐	☐	☐	☐	☐	☐
e. Participation in intervention research (efficacy/effectiveness studies)	☐	☐	☐	☐	☐	☐
f. [School] projects with education innovators (NGO,	☐	☐	☐	☐	☐	☐

government, etc.)						
g. Participation in [school] networks to exchange practices on educational equity	☐	☐	☐	☐	☐	☐
h. Proactive sharing of professional information on educational research and inclusion	☐	☐	☐	☐	☐	☐
i. Regular reviews of evidence and practice about education for equity	☐	☐	☐	☐	☐	☐
j. Digital community of practice to exchange information among teaching staff	☐	☐	☐	☐	☐	☐
k. Retreats to discuss and plan projects to improve equity	☐	☐	☐	☐	☐	☐
l. Other (specify)	☐	☐	☐	☐	☐	☐

6. Obstacles to overcome

6.1 INNOBS Which of the following factors have hampered your new solutions in the past 2 years and which would you need to overcome in the coming year in order to improve educational equity?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Hampered in the past 2 years			**To overcome in coming year**		
	Yes	No	Don't know	Yes	No	Don't know
a. Lack of time	☐	☐	☐	☐	☐	☐
b. Skill mismatch between staff skills and skills needed for the new solutions	☐	☐	☐	☐	☐	☐
c. Inadequate continuous professional learning and development	☐	☐	☐	☐	☐	☐
d. Lack of internal funding (e.g. funds to reallocate)	☐	☐	☐	☐	☐	☐
e. Lack of external funding (e.g. government or stakeholder funding)	☐	☐	☐	☐	☐	☐
f. Lack of interest of management at the [school]	☐	☐	☐	☐	☐	☐
g. Lack of interest of teaching staff	☐	☐	☐	☐	☐	☐
h. Lack of interest of end users (students, parents/guardians, community, etc.)	☐	☐	☐	☐	☐	☐
i. Fatigue with new solutions or reforms	☐	☐	☐	☐	☐	☐
j. Lack of knowledge about effective practices	☐	☐	☐	☐	☐	☐
k. High risks of failure	☐	☐	☐	☐	☐	☐
l. Lack of knowledge about how to monitor and evaluate success.	☐	☐	☐	☐	☐	☐
m. Other (specify)	☐	☐	☐	☐	☐	☐

PART III – Inclusive education

7. [School] facilities and equipment

[Self-reflection: This section aims to raise awareness of possible limitations of the [school]'s building(s) for inclusion as well as put the need for some type of specific equipment/software/services for certain students with special education needs.

Statistics: In case of statistical treatment, this information will provide information about the intensity of past new solutions, perception about its impact and targeted populations.]

7.1 INFNEE. To what extent does the [school]'s current physical infrastructure (buildings, space, and furniture) meets the needs for learning and well-being of the following groups of students:

	Fully	Partly	Not at all	Don't know/not relevant
a. Students with visual impairments including blindness *(Tactile strips on the floor and near the classroom doors, etc.)*	☐	☐	☐	☐
b. Students with other physical impairments *(Adjustable desks, accessible bathrooms, wide doorways, ramps, etc.)*	☐	☐	☐	☐
c. Other students (Quiet space, spaces for tutoring, mentoring, spaces for projects, etc.)	☐	☐	☐	☐

7.2 FACNEE. To what extent does the [school]'s equipment (hardware and software) provide the following groups of students access to all learning materials and full access to the curriculum:

	Fully	Partially	Not at all	Don't know/not relevant
a. Students with visual impairments including blindness *(Software for screen magnification/braille reading, etc.)*	☐	☐	☐	☐
b. Students who are deaf or hard of hearing *(Subtitles in multimedia materials, voice amplification for teaching staff, etc.)*	☐	☐	☐	☐
c. Students with other physical impairments *(Equipment to aid mobility for writing, etc.)*	☐	☐	☐	☐
d. Students with learning disabilities *(Software to help with reading or writing, etc.)*	☐	☐	☐	☐
e. Students with mental disorders *(Equipment to help focus or reduce anxiety, etc.)*	☐	☐	☐	☐

f. Other students with special education needs, such as those with long-term illnesses *(Ensuring a virtual presence in the classroom, etc.)*	☐	☐	☐	☐

8. Inclusive [school] environment

8.1 WBSUPP. Do you have programmes or other tailored support to improve the well-being of the following groups of students? *[definitions of these terms are included at the end of the survey]*

	Yes	No	Don't know/not relevant
a. Students with special educational needs *Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐
b. Students whose primary language is not the language of instruction or a dialect of this/these language(s)	☐	☐	☐
c. Students from minority ethnic groups *A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.*	☐	☐	☐
d. Gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐
e. Socio-economically disadvantaged students *Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.*	☐	☐	☐
f. LGBTQI+ students *LGBTQI+ stands for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex people.*	☐	☐	☐
g. Female students	☐	☐	☐
h. Male students	☐	☐	☐
i. Students of minority religions *Students whose religion is not very common in this country.*	☐	☐	☐
j. Students from a migrant background *Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they go to [school].*	☐	☐	☐
k. Other (specify)			

8.2 WBTYPE. Which of the following areas of well-being are captured as part of such support? *(Please select all that apply)*

a. Academic well-being ☐
b. Physical well-being ☐
c. Material well-being ☐
d. Psychological well-being ☐
e. Social well-being ☐

9. General information

[Self-reflection: This section mainly matters to identify for possible statistical use of the responses and to provide external quantitative benchmarks to respondents. Two aspects remain key: identify this is the "leaders" responses and identifying the population possibly targeted by equity.

Statistics: In case of statistical treatment, this information will allow to provide background information about the respondent and establishment – and allow for correlational analysis.]

9.1 EDUPRO Which of the following best describes the educational provision of your [school]?

a. Primary education ☐
b. Lower secondary education ☐
c. Upper secondary education ☐
d. Post-secondary non-tertiary education ☐
e. Tertiary education ☐

9.2a PROROL (if NOT tertiary education) Which of the following best describes your current professional role?

a. District administrator, head of a multiple [schools] ☐
b. Principal of the [school] ☐
c. Vice/Deputy Principal, Assistant Principal ☐
d. Other: [*please specify*]

9.2b PROROL (IF tertiary education) Which of the following best describes your current professional role?

a. Dean or Principal ☐
b. Vice Dean, Head of Department ☐
c. Professor, Associate Professor, Assistant Professor, Lecturer, Reader ☐
d. Other: [*please specify*]

9.3 PROEXP How long have you worked in a management position in education?

Number of years: _____

9.4 ORGSIZ. How many students does your [school] have in [this year]?

Number of students (Full Time Equivalent): _____

9.5 STASIZ. How many teaching staff does your [school] have in [this year]?

Number of teaching staff (Full Time Equivalent): _____

9.6 SHADIS. Please estimate the percentage of students in your [school] who have the following characteristics (students may fall into multiple categories)

	0	1-10%	11-30%	31-60%	>60%	Don't know
a. Students from ethnic minority backgrounds *A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.*	☐	☐	☐	☐	☐	☐

b. Students whose primary language is not the language of instruction or a dialect of this/these language(s)	☐	☐	☐	☐	☐	☐
c. Socio-economically disadvantaged students *Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.*	☐	☐	☐	☐	☐	☐
d. Students from a migrant background *Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they access educational services*	☐	☐	☐	☐	☐	☐
e. Students with learning disabilities *Learning disabilities are disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, co-ordinate movements, or direct attention. The most common Learning Disabilities are: Dyslexia, Dyscalculia, Dysgraphia, and Auditory Processing Disorder (APD).*	☐	☐	☐	☐	☐	☐
f. Students with physical impairments *Physical impairments affect the ability of individuals to access physical spaces due to reduced mobility or to access information that is delivered in specific ways: visual delivery for visual impairments and voice/sounds for hearing impairments. The most common physical impairments are: Mobility impairments, Visual impairments, and Hearing impairments.*	☐	☐	☐	☐	☐	☐
g. Students with mental disorders *The most common mental health conditions affecting children in school include: developmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder and Tourette's Syndrome; Depressive Disorders; Anxiety Disorders; Disruptive, Impulse-Control and Conduct Disorder (Oppositional defiant disorder - ODD, Conduct Disorder).*	☐	☐	☐	☐	☐	☐
h. Other (please specify)	☐	☐	☐	☐	☐	☐

Definitions

Terminology	Definition
Diversity in Education	Diversity in education is about the effort to include or involve people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc. Diversity has a lot of different aspects and might be related to physical aspects and/or immaterial ones such as cultural practices and makes sense according to the boundaries defined by groups of individuals.
Gifted students	Gifted students are students who have been classified as having significantly higher than expected intellectual abilities given their age, with intellectual abilities assessed through psychometric tests of cognitive functioning and/or performance in classroom evaluations. Students can also be gifted in specific domains that are not strictly academic in nature, such as music. Some countries include giftedness among the conditions included in special education needs.
LGBTQI+ students	The LGBTQI+ acronym refers to lesbian, gay, bisexual, transsexual, queer and intersexual people. The "+" is often added to include people who do not self-identify as heterosexual and/or cisgender but who would not apply the LGBTQI+ label to themselves either. Gender is a word that is used to talk about how people express masculine (traits most people think of as male) or feminine (traits most people think of as female) traits. It is commonly used for a person's sex (male or female) but this word only means someone's biology (body parts). Sexual orientation means who someone loves/is attracted to (of any gender)
Socio-economic status (socio-economically disadvantaged students)	Socio-economic status is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others. Socio-economic disadvantage, in this context, consists of students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.
Students from a migrant background	People are considered to have a migrant background if they or at least one of their parents was born in a country that is different from the country in which they go to [school]. The terminology "students from a migrant background" will be used for all students with an experience of migration, i.e. immigrants, asylum seekers, refugees, internally displaced peoples, etc.
Students from minority ethnic groups	A student that comes or is considered to come from a different ethnic group than the majority population in the country. An ethnic group is a group of people who share characteristics that distinguish them from other groups such as a common set of traditions, ancestry, language, history, society, culture, nation, religion or social treatment within their residing area.
Students with special education needs (SEN)	"Special education needs" is a term used in many education systems to characterise the broad array of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders. SEN are categorised into three, broad groups in this survey.
Learning Disabilities	Learning disabilities are disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, co-ordinate movements, or direct attention. The most common Learning Disabilities are: Dyslexia, Dyscalculia, Dysgraphia, and Auditory Processing Disorder (APD).
Mental disorders	Poor mental health can be both a consequence of lack of support for students experiencing disabilities and impairments, as well as a distinct medical condition hampering students' academic progress and broader well-being. The most common mental health conditions affecting children in school include: developmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum

	Disorder and Tourette's Syndrome; Depressive Disorders; Anxiety Disorders; Disruptive, Impulse-Control and Conduct Disorder (Oppositional defiant disorder - ODD, Conduct Disorder).
Physical impairments	Physical impairments affect the ability of individuals to access physical spaces due to reduced mobility or to access information that is delivered in specific ways: visual delivery for visual impairments and voice/sounds for hearing impairments. The most common physical impairments are: Mobility impairments, Visual impairments, and Hearing impairments.
Student well-being	The project focuses on different dimensions of individual student well-being: academic, psychological, social, physical and material well-being.
Academic well-being	The academic dimension of students' well-being refers to the skills and foundations students have to participate effectively in today's society, as lifelong learners, effective workers and engaged citizens. It comprises students' proficiency in academic subjects, their ability to collaborate with others to solve problems and their sense of mastery in-school subjects. It incorporates actions and behaviours that may promote the acquisition of knowledge, skills or information that may aid them when they are faced with new, complex ideas and problems.
Material well-being	Material resources make it possible for families to better provide for their children's needs and for schools to support students' learning and healthy development. Households who live in poverty find it difficult to ensure that their children have access to the educational and cultural resources they need to thrive in school and to realise their potential.
Physical well-being	The physical dimension of students' well-being refers to students' health status, safety and security, having the opportunity to engage with others and not to be limited by physical barriers in access and mobility. It also encompasses the ability to exercise and adopt healthy eating habits.
Psychological well-being	The psychological dimension of student well-being includes students' evaluations and views about life, their engagement with school, the extent to which they have a sense of agency, identity and empowerment, and having the possibility of developing goals and ambitions for their future.
Social well-being	The social dimension of students' well-being refers to the quality of their social lives including their relationship with their family, their peers and their teachers (positive or negative), and how they perceive their social life in school and beyond.
Disadvantaged students	The notion of "disadvantage" is used to qualify students in a situation of vulnerability and with diverse needs. Factors affecting vulnerability might include special education needs, socio-economic status, migrant or minority ethnic backgrounds, sexual orientation (LGBTQI+ status), gender or giftedness. Similar terms used for such students include "vulnerable", "at-risk" or "marginalised".
Creativity	Creativity means coming up with new ideas and solutions. It entails: • Making connections to other concepts and knowledge from the same or other disciplines; • Generating and playing with unusual or radical ideas; • Producing, performing, or envisioning a meaningful output that is personally novel; • Reflecting on the novelty of the solution and its possible consequences.
Critical thinking skills	Critical thinking means questioning and evaluating ideas and solutions. It entails: • Identifying and question assumptions and generally accepted ideas or practices; • Considering several perspectives on a problem based on different assumptions; • Being able to consider other theories and perspectives.
Staff	Staff is defined as any employee of the [school].

Bullying	Bullying is the repeated use of one's strength or popularity to injure, threaten, or embarrass another person on purpose. Bullying can be physical, verbal, or social.

Annex 5.B. Self-reflection survey on equity and innovation: Teaching staff

This Annex presents the survey questionnaire to be answered by teaching staff in the institution. The questionnaire can (and should) be adapted to the local context (in line with the adaptation of the other questionnaires targeting other stakeholders in the institution). Some terms (e.g. job titles) need to be customised depending on whether it is administered in secondary education schools or higher education institutions. The scope of the inequity issues can be adapted, although it is better to keep it as broad as possible.

Description

This is an innovation survey specifically targeted at [schools]. Its purpose is to collect help promote self-reflection around how new solutions affect equity at this [school], and how this [school] uses new solutions to improve equity. This version is specific to "[TEACHERS]". Please answer specifically to the campus or part of the [school] you are responsible for. If you teach at multiple campuses and/or multiple levels of education – please answer with all of those in mind. The data collected in this survey is treated confidentially. Data from the school leader and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context. Definitions or concepts may need to be altered to fit country contexts.

Terminology	Definition
Equity in education	Equity in education means that the achievement of educational potential in a [school] is not the result of personal and social circumstances, including factors such as gender, ethnic origin, immigrant status, special education needs and giftedness. Equity can be achieved both at the [school] level and system level, but given this is a [school] survey, ensuring equitable achievement of educational potential in the institution is the key focus of this concept.

PART I - Diagnosis

1. Innovation need and diagnosis

[Self-reflection: This section aims to make the respondent reflect on past new solutions targeted to equity, to reflect on how it was targeted on different types of possible beneficiaries of equity practices and to help identify the needs for possible future new solutions and improvement in this area.

Statistics: In case of statistical treatment, this information will provide information about the intensity of past new solutions, perception about its impact and targeted populations. It will also allow to compare some of the responses in this section to responses in the next sections (feedback on areas for improvement and how this could be done).]

1.1 MOTINO. How important are the following reasons for you to improve equity at your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not applicable
a. Increasing the overall student performance	☐	☐	☐	☐
b. Addressing the concerns of the external community (e.g. parents/guardians)	☐	☐	☐	☐
c. Closing achievement gaps between students at the [school]	☐	☐	☐	☐
d. Closing achievement gaps with other [schools]	☐	☐	☐	☐
e. Promoting equity for disadvantaged students in areas other than achievement at your [school]	☐	☐	☐	☐
f. Meeting national/state targets or regulations	☐	☐	☐	☐
g. Addressing the safety of disadvantaged students at the [school]	☐	☐	☐	☐
h. Contributing to a more equal society (beyond education)	☐	☐	☐	☐
i. Other: [please describe]				

1.2 TARGETIMP. In your [school], which three groups of students do you think require the most support to improve educational equity in the next two years? (*Please select three of the options below*)

[definitions of these terms are included at the end of the survey]

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

a. Students with special educational needs ☐

Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders..

b. Students whose primary language is not the language of instruction or a dialect of this/these language(s) ☐

c. Students from minority ethnic groups ☐

A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.

d. Gifted students ☐

Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically).

e. Low socio-economic status students ☐

Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups

f. LGBTQI+ students ☐

g. Students of a particular gender (female- or male-specific gender-related inequalities) ☐

h. Students of minority religions ☐

i. Students from a migrant background ☐

Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they access educational services

j. Other groups of students: [please describe]

1.3 INNOVDIAG. How important are new practices in the following areas to improving educational equity in your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐	☐
b. Assessment practices	☐	☐	☐	☐
c. Admission policy	☐	☐	☐	☐
d. Discipline and expulsion policy	☐	☐	☐	☐
e. Class composition (including formal/informal tracks and ability groupings)	☐	☐	☐	☐
f. Communication with students and parents/guardians	☐	☐	☐	☐
g. Student support programmes	☐	☐	☐	☐
h. Work responsibilities or communication among teaching staff	☐	☐	☐	☐
i. Collaboration among teaching and non-teaching staff	☐	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐	☐
k. Other [please describe]				

1.4 PSTINN. In the past two years, that what extent did your [school] introduce new practices in the following areas in order to improve educational equity:

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Fully	Partly	Not at all	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐	☐
b. Assessment practices	☐	☐	☐	☐
c. Admission policy	☐	☐	☐	☐
d. Discipline and exclusion policy	☐	☐	☐	☐
e. Class composition (including formal/informal tracks and ability groupings)	☐	☐	☐	☐
f. Communication with students and parents/guardians	☐	☐	☐	☐
g. Student support programmes	☐	☐	☐	☐
h. Work responsibilities or communication among teaching staff	☐	☐	☐	☐
i. Collaboration among teaching and non-teaching staff	☐	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐	☐
k. Other [please describe]				

1.5 FLALRC. In the past two years, have you personally introduced (new) teaching and learning practices in the following areas in order to improve educational equity:

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Yes	No	Don't know
a. New approaches to assignments or problems in the course	☐	☐	☐
b. Encouraging students to explore different kinds of study methods	☐	☐	☐
c. Using different teaching methods across my course (e.g. by explaining things in different ways or using different mediums to do so)	☐	☐	☐
d. A focus on developing creativity *Creativity means coming up with new ideas and solutions*	☐	☐	☐
e. A focus on developing critical thinking *Critical thinking means questioning and evaluating ideas and solutions*	☐	☐	☐
f. Collaborative projects in class (preferably putting together different types of students in one group)	☐	☐	☐

1.6 IMPINN. How much have the following outcomes improved due to new practices that your [school] or yourself have introduced (see questions 1.4 and 1.5) to improve the equity of students at your [school]? (If you answered "not at all to all options in Q1.4 and Q1.5 please go to question 1.7).

[definitions of these terms are included at the end of the survey]

Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not at all	Somewhat	A lot	Don't know/not relevant
a. Student well-being	☐	☐	☐	☐
b. Educational equality across socio-economic groups	☐	☐	☐	☐
c. Equality across socio-economic groups in areas other than educational achievement at your [school]	☐	☐	☐	☐
d. Gender equality	☐	☐	☐	☐
e. Educational attainment of disadvantaged students	☐	☐	☐	☐
f. Academic outcomes of disadvantaged students	☐	☐	☐	☐
g. Dropout rates of disadvantaged students	☐	☐	☐	☐
h. Inclusive learning environment	☐	☐	☐	☐
i. A safe [school] environment	☐	☐	☐	☐

1.7 INEVAL How important do you think the following evaluation methods are to evaluating new solutions to improve educational equity at your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Monitoring through key performance indicators	☐	☐	☐	☐
b. Internal evaluation of the impacts of new solutions	☐	☐	☐	☐
c. Impact evaluation by external stakeholders	☐	☐	☐	☐
d. Feedback from [teachers] (e.g. surveys, focus groups)	☐	☐	☐	☐
e. Feedback from parents/guardians (e.g. surveys, focus groups)	☐	☐	☐	☐
f. Feedback from students (e.g. surveys, focus groups)	☐	☐	☐	☐

PART II - Practices

2. Support for teaching and learning

[Self-reflection: This section aims to raise awareness of the importance of proposing adapted learning resources, diagnosis assessment, additional support, and customised instruction.

Statistics: In case of statistical treatment, this information will provide information about new pedagogical solutions and areas for future improvement.]

2.1 EFFINC In which of the following areas have you made (and plan to make) a concerted effort to improve educational equity for different groups of students (e.g. students with special educational needs, socio-

economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	In the past 2 years			In the coming year		
	Yes	No	Don't know	Yes	No	Don't know
a. Personalised learning materials/technology	☐	☐	☐	☐	☐	☐
b. Diagnosis assessments to better tailor support	☐	☐	☐	☐	☐	☐
c. Individualised learning plans	☐	☐	☐	☐	☐	☐
d. More diversity-conscious learning materials	☐	☐	☐	☐	☐	☐
e. Individual tutoring (in or out of school)	☐	☐	☐	☐	☐	☐
f. Group tutoring (in or out of school)	☐	☐	☐	☐	☐	☐
g. Emphasis on experiential or "active" learning	☐	☐	☐	☐	☐	☐
h. Emphasis on memorisation and repeated practice	☐	☐	☐	☐	☐	☐
i. Interdisciplinary/community projects	☐	☐	☐	☐	☐	☐
j. New assessment methods	☐	☐	☐	☐	☐	☐
k. Small group instruction	☐	☐	☐	☐	☐	☐
l. Other [please specify]						

3. School administrative practices

3.1 ADMPRA To what extent do you think changing the following administrative practices would improve educational equity?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not at all	Somewhat	A lot	Don't know/not relevant
a. Admission (enrolment) practices	☐	☐	☐	☐
b. Discipline and code of conduct (e.g. that affect certain groups of students disproportionately or have a negative impact on the academic learning of more disadvantaged students)	☐	☐	☐	☐
c. Expulsion policy (both formal and informal)	☐	☐	☐	☐
d. Interventions to prevent dropouts	☐	☐	☐	☐
e. Tracking of student performance/development within the [school]	☐	☐	☐	☐
f. Promotion of teaching staff diversity (gender, ethnic, religious, etc.)	☐	☐	☐	☐
g. Other [please specify]				

4. Student support and well-being

4.1 SERINC To what extent do you think changing the following services/practices would lead to improving educational equity for different groups of students in your [school] (e.g. students with special educational needs, socio-economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	A lot	Somewhat	Not at all	Don't know/not relevant
a. Guidance services (career guidance, study guidance, etc.)	☐	☐	☐	☐
b. Counselling services	☐	☐	☐	☐
c. Nutrition for low socio-economic status students	☐	☐	☐	☐
d. Equipment loans to support students who need it to study at home and access online learning materials	☐	☐	☐	☐
e. Funding to make all [school] activities inclusive regardless of family income	☐	☐	☐	☐
f. School projects related to minority cultures or identities	☐	☐	☐	☐
g. Programmes to prevent and raise awareness of bullying	☐	☐	☐	☐
h. Sensitisation to and prevention of discriminatory behaviours	☐	☐	☐	☐
i. More engagement and communication with parents/guardians of the most disadvantaged students	☐	☐	☐	☐
j. Projects with communities and actors outside [school]	☐	☐	☐	☐
k. Other [please specify]				

5. Knowledge and innovation practices

5.1 LEPRAC How important are the following knowledge and learning practices for you to develop the capacity and knowledge to implement the most effective practices to improve educational equity in your class and interactions with your students?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Dedicated unit to support teaching and learning for students with special education needs	☐	☐	☐	☐
b. Organisation of widely accessible, dedicated training	☐	☐	☐	☐
c. Projects with other [schools]	☐	☐	☐	☐

d. Action-research projects with education researchers	☐	☐	☐	☐
e. Participation in intervention research (efficacy/effectiveness studies)	☐	☐	☐	☐
f. [School] projects with education innovators (NGO, government, etc.)	☐	☐	☐	☐
g. Participation in a [school] network on educational equity to exchange practices	☐	☐	☐	☐
h. Proactive sharing of professional information on educational research and inclusion	☐	☐	☐	☐
i. Regular reviews of evidence and practice about education for equity	☐	☐	☐	☐
j. Digital community of practice to exchange information among teaching staff	☐	☐	☐	☐
k. Retreats to discuss and plan projects to improve equity	☐	☐	☐	☐
l. Other [please specify]				

6. Obstacles to overcome

6.1 INNOBS How important are the following obstacles to your personal ability to innovate to improve educational equity?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Lack of time	☐	☐	☐	☐
b. Skill mismatch between your skills and skills needed for the new solutions	☐	☐	☐	☐
c. Inadequate continuous professional learning and development	☐	☐	☐	☐
d. Lack of internal funding (e.g. funds to reallocate)	☐	☐	☐	☐
e. Lack of external funding (e.g. government or stakeholder funding)	☐	☐	☐	☐
f. Lack of interest of management at the [school]	☐	☐	☐	☐
g. Personal lack of interest	☐	☐	☐	☐
h. Lack of interest of end users (students, parents/guardians, community, etc.)	☐	☐	☐	☐
i. Fatigue with new solutions or reforms	☐	☐	☐	☐
j. Lack of knowledge about effective practices	☐	☐	☐	☐

k. High risks of failure	☐	☐	☐	☐
l. Lack of knowledge about how to monitor and evaluate success	☐	☐	☐	☐
m. Other (specify)	☐	☐	☐	☐

PART III – Inclusive education

7. School facilities and equipment

[Self-reflection: This section aims to raise awareness of possible limitations of the [school] building(s) for inclusion as well as put the need for some type of specific equipment/software/services for certain students with special education needs.

Statistics: In case of statistical treatment, this information will provide information about the intensity of past new solutions, perception about its impact and targeted populations.]

7.1 INFNEE. To what extent does the [school]'s current physical infrastructure (buildings, space, and furnishing) meet the needs for learning and well-being of the following groups of students:

[definitions of these terms are included at the end of the survey]

	Fully	Partly	Not at all	Don't know/not relevant
a. Blind and visually impaired students *(Tactile strips on the floor and near the classroom doors, etc.)*	☐	☐	☐	☐
b. Other physically impaired students *(Adjustable desks, accessible bathrooms, wide doorways, ramps, etc.)*	☐	☐	☐	☐
c. Other students (Quiet space, spaces for tutoring, mentoring, spaces for projects, etc.)	☐	☐	☐	☐

7.2 FACNEE. To what extent does the [school]'s equipment (hardware and software) provide the following groups of students access to all learning materials and full access to the curriculum:

[definitions of these terms are included at the end of the survey]

	Fully	Partially	Not at all	Don't know/not relevant
a. Blind and visually impaired students *(Software for screen magnification/braille reading, etc.)*	☐	☐	☐	☐
b. Deaf and hard of hearing students *(Subtitles in multimedia materials, voice amplification for teaching staff, etc.)*	☐	☐	☐	☐

c. Other physically impaired students *(Equipment to aid mobility for writing, etc.)*	☐	☐	☐	☐
d. Students with learning disabilities *(Software to help with reading or writing, etc.)*	☐	☐	☐	☐
e. Students with mental disorders *(Equipment to help focus or reduce anxiety, etc.)*	☐	☐	☐	☐
f. Other students with special education needs, such as those with long-term illnesses *(Ensuring a virtual presence in the classroom, etc.)*	☐	☐	☐	☐

8. Inclusive [school] environment

8.1 WBSUPP. To what extent do you think the well-being needs of the following groups of students are met at your [school]? *[definitions of these terms are included at the end of the survey]*

	Fully	Partially	Not at all	Don't know/not relevant
a. Students with special educational needs *Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders*	☐	☐	☐	☐
b. Students whose primary language is not the language of instruction or a dialect of this/these language(s)	☐	☐	☐	☐
c. Students from minority ethnic groups *A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.*	☐	☐	☐	☐
d. Gifted students *Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)*	☐	☐	☐	☐
e. Socio-economically disadvantaged students *Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.*	☐	☐	☐	☐
f. LGBTQI+ L*GBTQI+ stands for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex people*	☐	☐	☐	☐
g. Female students	☐	☐	☐	☐
h. Male students	☐	☐	☐	☐
i. Students of minority religions *Students whose religion is not very common in this country.*	☐	☐	☐	☐
j. Students from a migrant background *Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they go to [school].*	☐	☐	☐	☐
k. Other (specify)				

8.2 WBTYPE. Which of the following areas of well-being require more attention at your [school]? (Please select all that apply) [definitions of these terms are included at the end of the survey]

a. Academic well-being ☐
b. Physical well-being ☐
c. Material well-being ☐
d. Psychological well-being ☐
e. Social well-being ☐

9. General information

[Self-reflection: This section mainly matters to identify for possible statistical use of the responses and to provide external quantitative benchmarks to respondents. Two aspects remain key: identify this is the "leaders" responses and identifying the population possibly targeted by equity.

Statistics: In case of statistical treatment, this information will allow to provide background information about the respondent and establishment – and allow for correlational analysis.]

9.1a PRROL. (if NOT tertiary education) Which of the following best describes your current professional role?

a. Teaching staff ☐
b. Teaching assistant ☐
c. Administrative employee ☐
d. Other: [please describe] ☐

9.1b PRROL. (IF tertiary education) Which of the following best describes your current professional role?

a. Professor ☐
b. Associate professor ☐
c. Assistant professor/lecturer/reader ☐
d. Teaching assistant ☐
e. Administrative employee ☐
f. Other: [please describe] ☐

9.2 PROEXP How long have you worked in education?

Number of years: _____

Definitions

Terminology	Definition
Diversity in Education	Diversity in education is about the effort to include or involve people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc. Diversity has a lot of different aspects and might be related to physical aspects and/or immaterial ones such as cultural practices, and makes sense according to the boundaries defined by groups of individuals.
• Gifted students	Gifted students are students who have been classified as having significantly higher than expected intellectual abilities given their age, with intellectual abilities assessed through psychometric tests of cognitive functioning and/or performance in classroom evaluations. Students can also be gifted in specific domains that are not strictly academic in nature, such as music. Some countries include giftedness among the conditions included in special education needs.
• LGBTQI+ students	The LGBTQI+ acronym refers to lesbian, gay, bisexual, transsexual, queer and intersexual people. The "+" is often added to include people who do not self-identify as heterosexual and/or cisgender but who would not apply the LGBTQI label to themselves either. Gender is a word that is used to talk about how people express masculine (traits most people think of as male) or feminine (traits most people think of as female) traits. It is commonly used for a person's sex (male or female) but this word only means someone's biology (body parts). Sexual orientation means who someone loves/is attracted to (of any gender)
• Socio-economic status (socio-economically disadvantaged students)	Socio-economic status is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others. Socio-economic disadvantage, in this context, consists of students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.
• Students from a migrant background	Individuals are considered to have a migrant background if they or at least one of their parents was born in a country that is different from the country in which they access educational services. The terminology "students from a migrant background" will be deployed to include all students with an experience of migration, i.e. immigrants, asylum seekers, refugees, internally displaced peoples, etc.
• Students from minority ethnic groups	A student that comes or is considered to come from a different ethnic group than the majority population in the country. An ethnic group is a group of people who share characteristics that distinguish them from other groups such as a common set of traditions, ancestry, language, history, society, culture, nation, religion or social treatment within their residing area.
• Students with special education needs (SEN)	"Special education needs" is a term used in many education systems to characterise the broad array of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders. SEN are categorised into three, broad groups in this survey.
○ Learning Disabilities	Learning disabilities are disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, co-ordinate movements, or direct attention. The most common Learning Disabilities are: Dyslexia, Dyscalculia, Dysgraphia, and Auditory Processing Disorder (APD).
○ Mental disorders	Poor mental health can be both a consequence of lack of support for students experiencing disabilities and impairments, as well as a distinct medical condition hampering students' academic progress and broader well-being. The most common mental health conditions affecting children in school include: developmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder and Tourette's Syndrome; Depressive Disorders; Anxiety Disorders; Disruptive, Impulse-Control and Conduct Disorder (Oppositional defiant disorder - ODD,

	Conduct Disorder).
○ Physical impairments	Physical impairments affect the ability of individuals to access physical spaces due to reduced mobility or to access information that is delivered in specific ways: visual delivery for visual impairments and voice/sounds for hearing impairments. The most common physical impairments are: Mobility impairments, Visual impairments, and Hearing impairments.
Student well-being	The project focuses on different dimensions of individual student well-being: academic, psychological, social, physical and material well-being.
• Academic well-being	The academic dimension of students' well-being refers to the skills and foundations students have to participate effectively in today's society, as lifelong learners, effective workers and engaged citizens. It comprises students' proficiency in academic subjects, their ability to collaborate with others to solve problems and their sense of mastery in-school subjects. It incorporates actions and behaviours that may promote the acquisition of knowledge, skills or information that may aid them when they are faced with new, complex ideas and problems.
• Material well-being	Material resources make it possible for families to better provide for their children's needs and for schools to support students' learning and healthy development. Households who live in poverty find it difficult to ensure that their children have access to the educational and cultural resources they need to thrive in school and to realise their potential.
• Physical well-being	The physical dimension of students' well-being refers to students' health status, safety and security, having the opportunity to engage with others and not to be limited by physical barriers in access and mobility. It also encompasses the ability to exercise and adopt healthy eating habits.
• Psychological well-being	The psychological dimension of student well-being includes students' evaluations and views about life, their engagement with school, the extent to which they have a sense of agency, identity and empowerment, and having the possibility of developing goals and ambitions for their future.
• Social well-being	The social dimension of students' well-being refers to the quality of their social lives including their relationship with their family, their peers and their teachers (positive or negative), and how they perceive their social life in school and beyond.
Disadvantaged students	The notion of "disadvantage" is used to qualify students in a situation of vulnerability and with diverse needs. Factors affecting vulnerability might include special education needs, socio-economic status, migrant or minority ethnic backgrounds, LGBTQI+ status, gender or giftedness. Similar terms used for such students include "vulnerable", "at-risk" or "marginalised".
Creativity	Creativity means coming up with new ideas and solutions. It entails: • Making connections to other concepts and knowledge from the same or other disciplines; • Generating and playing with unusual or radical ideas; • Producing, performing, or envisioning a meaningful output that is personally novel; • Reflecting on the novelty of the solution and its possible consequences;
Critical thinking skills	Critical thinking means questioning and evaluating ideas and solutions. It entails: • Identifying and question assumptions and generally accepted ideas or practices; • Considering several perspectives on a problem based on different assumptions; • Being able to consider other theories and perspectives;
Staff	Staff is defined as any employee of the [school].
Bullying	Bullying is the repeated use of one's strength or popularity to injure, threaten, or embarrass another person on purpose. Bullying can be physical, verbal, or social.

Annex 5.C. Self-reflection survey on equity and innovation: Higher education students

This Annex presents the survey questionnaire to be answered by higher education students (if the survey is carried out in higher education). The next Annex presents the questionnaire for secondary students. The questionnaire can (and should) be adapted to the local context (in line with the adaptation of the other questionnaires targeting other stakeholders in the institution). The scope of the inequity issues can be adapted to the local context, although it is better to keep it as broad as possible.

Description

This is an innovation survey specifically targeted at [schools]. Its purpose is to collect information that helps promote self-reflection around how new solutions affect equity at this [school], and how this [school] uses new solutions to improve equity. This version is specific to "[STUDENTS]". The data collected in this survey is treated confidentially. Data from the school leader and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context. Definitions or concepts may need to be altered to fit country contexts.

Terminology	Definition
Equity in education	Equity in education means that the achievement of educational potential in a [school] is not the result of personal and social circumstances, including factors such as gender, ethnic origin, immigrant status, special education needs and giftedness. Equity can be achieved both at the [school] level and system level, but given this is a [school] survey, ensuring equitable achievement of educational potential in the institution is the key focus of this concept.

PART I - Diagnosis

1. Innovation need and diagnosis

1.1 TARGETIMP. Which three groups of students do you think need more support to improve your [school]'s educational equity in the next two years? (*Please select three of the options below*)

[definitions of these terms are included at the end of the survey]

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

a. Students with special educational needs ☐

Students with special education needs are affected by learning disabilities, physical impairments and/or mental disorders

b. Students whose primary language is not the language of instruction or a dialect of this/these language(s) ☐

c. Students from minority ethnic groups ☐

A student that comes or is considered to come from a different ethnic background than the majority population in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.

d. Gifted students ☐

Gifted students are students who have been classified as having significantly higher than expected abilities given their age (e.g. intellectual, musical, athletically)

e. Low socio-economic status students ☐

Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.

f. LGBTQI+ students ☐

g. Students of a particular gender (female- or male-specific gender-related inequalities) ☐

h. Students of minority religions ☐

i. Students from a migrant background ☐

Students who themselves or of whom at least one of their parents was born in a country that is different from the country in which they go to [school]

1.2 INNOVDIAG. How important do you think changes in the following practices could be to improve equity in your [school]?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not important	Somewhat important	Very important	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐	☐
b. Assessment practices	☐	☐	☐	☐
c. Admission policy/practices	☐	☐	☐	☐
d. Level of tuition fees	☐	☐	☐	☐

e. Expulsion policy	☐	☐	☐	☐
f. Communication with students (and parents/guardians if relevant)	☐	☐	☐	☐
g. Student support programmes	☐	☐	☐	☐
h. Work responsibilities or communication among teaching staff	☐	☐	☐	☐
i. Increased financial support for students	☐	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐	☐
k. Other [please specify]				

1.3 PSTINN. In the last two years, did your [school] introduce new practices in the following areas that could improve educational equity:

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Yes	No	Don't know/not relevant
a. Teaching and learning practices	☐	☐	☐
b. Assessment practices	☐	☐	☐
c. Admission policy	☐	☐	☐
d. Level of tuition fees	☐	☐	☐
e. Exclusion policy	☐	☐	☐
f. Communication with students	☐	☐	☐
g. Student support programmes	☐	☐	☐
h. Work responsibilities or communication among teaching staff	☐	☐	☐
i. Increased financial support for students	☐	☐	☐
j. [School] facilities or infrastructure	☐	☐	☐
k. Other [please specify]			

1.4 FLALRC. In the past two years, did teaching staff introduce (new) teaching and learning practices in the following areas in order to improve educational equity:

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Yes	No	Don't know
a. New approaches to assignments or problems	☐	☐	☐
b. Encouraging students to explore different kinds of learning methods	☐	☐	☐

c. Using different teaching methods across my course (e.g. by explaining things in different ways or using different mediums to do so)	☐	☐	☐
d. A focus on developing creativity *Creativity means coming up with new ideas and solutions*	☐	☐	☐
e. A focus on developing critical thinking *Critical thinking means questioning and evaluating ideas and solutions*	☐	☐	☐
f. Collaborative projects in class (preferably putting together different types of students in one group)	☐	☐	☐

1.5 IMPINN. How much have the following outcomes improved due to new practices that your [school] or yourself have introduced (see questions 1.3 and 1.4) to improve the equity of students at your [school]? (If you answered "not at all to all options in Q1.3 and Q1.4 please go to question 1.6).

[definitions of these terms are included at the end of the survey]

Disadvantaged students may be in a situation of vulnerability or have diverse needs, such as a minority background or identity, or are from low socio-economic status backgrounds.

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not at all	Somewhat	A lot	Don't know/not relevant
a. Student well-being	☐	☐	☐	☐
b. Educational equality across socio-economic groups	☐	☐	☐	☐
c. Equality across socio-economic groups in areas other than educational achievement at your [school]	☐	☐	☐	☐
d. Gender equality	☐	☐	☐	☐
e. Educational attainment of disadvantaged students	☐	☐	☐	☐
f. Academic outcomes of disadvantaged students	☐	☐	☐	☐
g. Dropout rates of disadvantaged students	☐	☐	☐	☐
h. Inclusive learning environment	☐	☐	☐	☐
i. A safe [school] environment	☐	☐	☐	☐

1.6 INOINP Are you consulted for feedback before the introduction of new solutions using the following methods? *Please select all that apply*

a Surveys ☐
b Focus groups ☐
c Pilot testing ☐
d Invitation to provide written feedback ☐
e I'm never asked to provide feedback to new solutions ☐

1.7 INEVAL Are you consulted for feedback after the introduction of new solutions using the following methods? *Please select all that apply*

a Surveys ☐
b Focus groups ☐
c Pilot testing ☐

d Invitation to provide written feedback ☐

e I'm never asked to provide feedback to new solutions ☐

PART II - Practices

2. Support for teaching and learning

2.1 EFFINC How effective do you think the following practices are to improve educational equity for different groups of students within your [school] (e.g. students with special educational needs, socio-economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Very effective	Somewhat effective	Not effective	Not in use	Don't know
a. Personalised learning materials/technology	☐	☐	☐	☐	☐
b. Diagnosis assessments to better tailor support	☐	☐	☐	☐	☐
c. Individualised learning plans/coaching	☐	☐	☐	☐	☐
d. More diversity-conscious learning materials	☐	☐	☐	☐	☐
e. Remedial education	☐	☐	☐	☐	☐
f. Individual tutoring (in and out of school)	☐	☐	☐	☐	☐
g. Group tutoring (in and out of school)	☐	☐	☐	☐	☐
h. Emphasis on experiential or "active" learning	☐	☐	☐	☐	☐
i. Emphasis on memorisation and repeated practice	☐	☐	☐	☐	☐
j. Interdisciplinary/community projects	☐	☐	☐	☐	☐
k. New assessment methods	☐	☐	☐	☐	☐
l. Small group instruction	☐	☐	☐	☐	☐
m. Other [please specify]					

3. School administrative practices

3.1 ADMPRA To what extent do you think changing the following administrative practices would improve educational equity?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	Not at all	Somewhat	A lot	Don't know/not relevant
a. Admission (enrolment) practices (e.g. proportion of disadvantaged students at [school])	☐	☐	☐	☐
b. Expulsion policy (both formal and informal)	☐	☐	☐	☐
c. Tracking of student performance/development within the [school]	☐	☐	☐	☐
d. Promotion of teaching staff diversity (gender, ethnic, religious, etc.)	☐	☐	☐	☐
e. Other [please specify]				

4. Student support and well-being

4.1 SERINC To what extent do you think changing the following services/practices would improve educational equity for different groups of students in your institution (e.g. students with special educational needs, socio-economically disadvantaged students, students from minority ethnic groups, minority language students, students from a migrant background, LGBTQI+ students, female/male students, etc.)?

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

	A lot	Somewhat	Not at all	Don't know/not relevant
a. Guidance services (career guidance, study guidance, etc.)	☐	☐	☐	☐
b. Counselling services	☐	☐	☐	☐
c. Equipment loans to support students who need it to study at home and access online learning materials	☐	☐	☐	☐
d. Needs-based or merit-based scholarships to cover tuition fees and/or living costs	☐	☐	☐	☐
e. [School] projects related to minority cultures or identities	☐	☐	☐	☐
f. Programmes to prevent and raise awareness of bullying	☐	☐	☐	☐
g. Sensitisation to and prevention of discriminatory behaviours	☐	☐	☐	☐
h. More engagement and communication with the most disadvantaged students	☐	☐	☐	☐
i. Projects with communities and actors outside [school]	☐	☐	☐	☐
j. Other [please specify]				

5. Teaching and learning

5.1 STABEH. To what extent do you agree with the following statements about your [teachers].

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. Teaching staff care about my learning	☐	☐	☐	☐	☐
b. Teaching staff encourage me to work hard	☐	☐	☐	☐	☐
c. Teaching staff encourage me to ask questions and participate in discussions	☐	☐	☐	☐	☐
d. Teaching staff really listen to what I have to say	☐	☐	☐	☐	☐
e. Teaching staff treat all students the same	☐	☐	☐	☐	☐
f. Teaching staff pay attention to students according to their learning needs	☐	☐	☐	☐	☐
g. Teaching staff provide more support to students who need more attention	☐	☐	☐	☐	☐

5.2 CLAENV. To what extent do you agree with the following statements about your [studies].

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. There are opportunities in [class] to talk about poverty and inequity *Inequity means that your chance to succeed in [school] or in the community or country is related to your background, such as how much money your family has or the colour of your skin.*	☐	☐	☐	☐	☐
b. There are opportunities in [class] to talk about different forms of diversity (gender, ethnicity, sexual orientation, disability, etc.) *Gender is a word that is used to talk about how people express masculine traits (traits most people think of as male) or feminine traits (traits most people think of as female) Gender is often mistakenly used for a person's sex (male or female) but this word only means someone's biology (body parts.* *Sexual orientation means who someone loves/is attracted to (of any gender)* *Ethnicity refers to the group someone is a part of that shares a common language, traditions, ancestry, history, and so forth.*	☐	☐	☐	☐	☐
c. Teaching staff use positive examples of ethnicities, cultures, and backgrounds that are like mine *Ethnicity is defined under item b.*	☐	☐	☐	☐	☐
d. I see myself as a valuable member of the [classroom]	☐	☐	☐	☐	☐
e. I have chances to help decide what is best for the [class], [programme], or [school]	☐	☐	☐	☐	☐
f. I feel **unable** to share my views in [class] related to my background	☐	☐	☐	☐	☐
g. I feel like I belong in my [school]	☐	☐	☐	☐	☐

5.3 POVINC. To what extent do you agree with the following statements about access to teaching and learning at your [school].

Socio-economic background refers to someone's work experience and their or their family's economic and social position as compared to others.

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. Students can participate in all [school] activities regardless of their socio-economic background	☐	☐	☐	☐	☐
b. The financial support offered at this institution allows all students to access programmes regardless of how their socio-economic background	☐	☐	☐	☐	☐
c. This [school] accommodates students who need to work alongside their studies	☐	☐	☐	☐	☐
d. Admissions are not affected by your socio-economic background	☐	☐	☐	☐	☐

6. School environment

6.1 BULFRE. Please indicate to what extent you agree with the following statements about bullying and harassment. During this year at the institution, how often have

	Never	Almost never	Sometimes	Very often	Don't know
a. you heard negative comments from other students on poverty, ethnicity, gender, sexual orientation or religion? *Gender is a word that is used to talk about how people express masculine traits (traits most people think of as male) or feminine traits (traits most people think of as female) Gender is often mistakenly used for a person's sex (male or female) but this word only means someone's biology (body parts.* *Sexual orientation means who someone loves/is attracted to (of any gender)* *Ethnicity refers to the group someone is a part of that shares a common language, traditions, ancestry, history, and so forth.*	☐	☐	☐	☐	☐
b. you heard negative comments from teaching staff on poverty, ethnicity, gender, sexual orientation or religion? *For the definition of the terms see a.*	☐	☐	☐	☐	☐

6.2 BULPOL. Please indicate to what extent you agree with the following statements about bullying and harassment.

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. The [school] takes appropriate action if an incident is reported to them	☐	☐	☐	☐	☐
b. Students at this [school] will intervene when they see bullying or harassment	☐	☐	☐	☐	☐
c. Teaching staff or other faculty at this [school] will intervene when they see bullying or harassment	☐	☐	☐	☐	☐

PART III – Inclusive education

7. Inclusive institutional environment

7.1 WBSUPP. To what extent do you think the well-being needs of the following groups of students are met at your institution?

	Fully	Partially	Not at all	Don't know/not relevant
a. Students with special educational needs *Students with special education needs might need extra help at school because they have a disability or other face other challenges (such as depression) that makes it more difficult for them to learn.*	☐	☐	☐	☐
b. Students whose first language is different from the language of instruction or a dialect of this/these languages	☐	☐	☐	☐
c. Students from minority ethnic groups *A student that comes or is considered to come from a different ethnic group than biggest group in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.*	☐	☐	☐	☐
d. Gifted students *Gifted students are students who have special abilities for their age (e.g. intellectual, musical, or athletic)*	☐	☐	☐	☐
e. Socio-economically disadvantaged students *Students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.*	☐	☐	☐	☐
f. LGBTQI+ *LGBTQI+ stands for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex people.*	☐	☐	☐	☐
g. Female students	☐	☐	☐	☐
h. Male students	☐	☐	☐	☐
i. Students of minority religions *Students whose religion is not very common in this country.*	☐	☐	☐	☐
j. Students from a migrant background *Students who were born in a country that is different from the country in which they go to [school] or students with at least one parent who was born in another country*	☐	☐	☐	☐
k. Other [please specify]				

7.2 WBTYPE. To what extent do you agree with the following statements about your institution?

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. The institution supports my academic well-being	☐	☐	☐	☐	☐
b. The institution supports my physical well-being	☐	☐	☐	☐	☐
c. The institution supports my material well-being	☐	☐	☐	☐	☐
d. The institution supports my psychological well-being	☐	☐	☐	☐	☐
e. The institution supports my social well-being	☐	☐	☐	☐	☐

8. General information

[Self-reflection: This section mainly matters to identify for possible statistical use of the responses and to provide external quantitative benchmarks to respondents. Statistics: In case of statistical treatment, this information will allow to provide background information about the respondent and establishment – and allow for correlational analysis.]

8.1 EDULVL Which of the following best describes your educational programme?

a. Post-secondary non-tertiary education ☐
b. Short-cycle tertiary education ☐
c. Bachelor's or equivalent level ☐
d. Master's or equivalent level ☐
e. Doctoral or equivalent level ☐
f. Other: _____

8.2 AGE How old are you?

Age: _____

8.3 SEX What is your sex?

a. Male ☐
b. Female ☐
c. Prefer not to answer ☐
d. Other: _____

8.4 EDULEV What is the highest level of schooling of your parents or guardians?

a. Less than secondary school ☐
b. Secondary school graduate ☐
c. Vocational degree ☐
d. University degree ☐
e. Don't know ☐
f. Other: _____

Definitions

Terminology	Definition
Diversity in Education	Diversity in education is about the effort to include or involve people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc. Diversity has a lot of different aspects and might be related to physical aspects and/or immaterial ones such as cultural practices, and makes sense according to the boundaries defined by groups of individuals.
• Gifted students	Gifted students are students who have been classified as having significantly higher than expected intellectual abilities given their age, with intellectual abilities assessed through psychometric tests of cognitive functioning and/or performance in classroom evaluations. Students can also be gifted in specific domains that are not strictly academic in nature, such as music. Some countries include giftedness among the conditions included in special education needs.
• LGBTQI+ students	The LGBTQI+ acronym refers to lesbian, gay, bisexual, transsexual, queer and intersexual people. The "+" is often added to include people who do not self-identify as heterosexual and/or cisgender but who would not apply the LGBTQI label to themselves either. Gender is a word that is used to talk about how people express masculine (traits most people think of as male) or feminine (traits most people think of as female) traits. It is commonly used for a person's sex (male or female) but this word only means someone's biology (body parts). Sexual orientation means who someone loves/is attracted to (of any gender)
• Socio-economic status (socioeconomically disadvantaged students)	Socio-economic status is to describe a person's work experience and of an individual's or family's economic and social position as compared to others. Socio-economic disadvantage, in this context, consists of students who grow up in low-income families, and tend to have lower health and education outcomes than other groups.
• Students from a migrant background	People are considered to have a migrant background if they or at least one of their parents was born in a country that is different from the country in which they go to [school]. The term "students from a migrant background" will be used to include all students with an experience of migration, i.e. immigrants, asylum seekers, refugees, internally displaced peoples, etc.
• Students from minority ethnic groups	A student that comes or is considered to come from a different ethnic group than the majority population in the country. An ethnic group is a group of people who share characteristics that distinguish them from other groups such as a common set of traditions, ancestry, language, history, society, culture, nation, religion or social treatment within their residing area.
• Students with special education needs (SEN)	"Special education needs" is a term used in many education systems to characterise the range of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders. SEN are categorised into three, broad groups in this survey.
○ Learning Disabilities	Learning disabilities are disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, co-ordinate movements, or direct attention. The most common Learning Disabilities are: Dyslexia, Dyscalculia, Dysgraphia, and Auditory Processing Disorder (APD).
○ Mental disorders	Poor mental health can be both a consequence of lack of support for students experiencing disabilities and impairments, as well as a distinct medical condition hampering students' academic progress and broader well-being. The most common mental health conditions affecting children in school include: developmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder and Tourette's Syndrome; Depressive Disorders; Anxiety Disorders; Disruptive, Impulse-Control and Conduct Disorder (Oppositional defiant disorder - ODD, Conduct Disorder).

○ Physical impairments	Physical impairments affect the ability of individuals to access physical spaces due to reduced mobility or to access information that is delivered in specific ways: visual delivery for visual impairments and voice/sounds for hearing impairments. The most common physical impairments are: Mobility impairments, Visual impairments, and Hearing impairments.
Student well-being	The project focuses on different dimensions of individual student well-being: academic, psychological, social, physical and material well-being. Well-being means how you feel about yourself and your life. Have good well-being usually means being comfortable, healthy, or happy.
• Academic well-being	The academic dimension of students' well-being refers to the skills and foundations students have to participate effectively in today's society, as lifelong learners, effective workers and engaged citizens. It comprises students' proficiency in academic subjects, their ability to collaborate with others to solve problems and their sense of mastery in-school subjects. It incorporates actions and behaviours that may promote the acquisition of knowledge, skills or information that may aid them when they are faced with new, complex ideas and problems.
• Material well-being	Material resources make it possible for families to better provide for their children's needs and for schools to support students' learning and healthy development. Households who live in poverty find it difficult to ensure that their children have access to the educational and cultural resources they need to thrive in school and to realise their potential.
• Physical well-being	The physical dimension of students' well-being refers to students' health status, safety and security, having the opportunity to engage with others and not to be limited by physical barriers in access and mobility. It also encompasses the ability to exercise and adopt healthy eating habits.
• Psychological well-being	The psychological dimension of student well-being includes students' evaluations and views about life, their engagement with school, the extent to which they have a sense of agency, identity and empowerment, and having the possibility of developing goals and ambitions for their future.
• Social well-being	The social dimension of students' well-being refers to the quality of their social lives including their relationship with their family, their peers and their teachers (positive or negative), and how they perceive their social life in school and beyond.
Disadvantaged students	Disadvantaged students tend to need extra support to overcome challenges they face for a variety of reasons, such as a minority background or identity, or being from poorer family backgrounds.
Creativity	Creativity means coming up with new ideas and solutions. It entails: • Making connections to other concepts and knowledge from the same or other disciplines; • Generating and playing with unusual or radical ideas; • Producing, performing, or envisioning a meaningful output that is personally novel; • Reflecting on the novelty of the solution and its possible consequences.
Critical thinking skills	Critical thinking means questioning and evaluating ideas and solutions. It entails: • Identifying and question assumptions and generally accepted ideas or practices; • Considering several perspectives on a problem based on different assumptions; • Being able to consider other theories and perspectives.
Staff	Staff is defined as any employee of the [school].
Bullying	Bullying is the repeated use of one's strength or popularity to injure, threaten, or embarrass another person on purpose. Bullying can be physical, verbal, or social.

Annex 5.D. Self-reflection survey on equity and innovation: Secondary students

This Annex presents the survey questionnaire to be answered by secondary education students (if the survey is carried out in secondary education). The previous Annex presents the questionnaire for higher education students. The questionnaire can (and should) be adapted to the local context (in line with the adaptation of the other questionnaires targeting other stakeholders in the institution). The scope of the inequity issues can be adapted to the local context and the age of the targeted students, although it is better to keep it as broad as possible.

Description

This is a module with questions around innovation and equity at [schools]. Its purpose is to help promote self-reflection within a [school] to think about how new ideas influence equity, and how they could help equity. The main goal is to learn more about the strengths and weaknesses of how your [school] approaches equity, and to become a first step to conversations at [school] to think more about improving equity through new ideas. This version is specific to "STUDENTS". The data collected in this survey is treated confidentially. Data from the school leader, student, and teaching staff survey will be matched, but collected data will be treated anonymously.

All terms in [brackets] should be adapted to terms appropriate for the level of schooling, and country context.

Note for administrators of the survey:

- The terms in this survey are explained and defined to help students filling out the survey understand them as best as possible. However, it is possible that students may need to discuss the meaning of these concepts in the context of this survey or have further questions. As such, it might be helpful to have teachers (or other administrators) present to answer any questions students may have.
- There are some resources that might help this process, such as:
  - Some images and explanation to help understand the concept of equity, and the difference between equity and equality:

    https://www.mentalfloss.com/article/625404/equity-vs-equality-what-is-the-difference

Terminology	Definition
Equity in education	Equity in education means that everyone can achieve their potential in school, no matter who they are or where they come from (no matter, for example, their gender, ethnic background, or whether they or their parents come from this country or another country). Equity means making sure that the school considers what people's needs are when deciding how to treat them. This is not the same as everyone getting the "same" - because people have different needs. Equity means that everyone has a similar chance to succeed. This website has some more information and images that can help explain what equity means: https://www.mentalfloss.com/article/625404/equity-vs-equality-what-is-the-difference

PART I - Diagnosis

1. Innovation need and diagnosis

1.1 TARGETIMP. In your [school], which three groups of students do you think need more support to improve educational equity among students in the next two years? (Please select three of the options below)

Equity means treating everyone according to their needs – this means not everyone gets the "same" but rather means making sure everyone has a similar chance to succeed in [school] – for example, academically or socially.

Further definitions of these terms are included at the end of the survey.

a. Students with special education needs ☐

Students with special education needs might need extra help at school because they have a disability or other face other challenges (such as depression) that makes it more difficult for them to learn.

b. Students whose first language is different from the language (mostly) spoken in the [school] or a dialect of this/these languages ☐

c. Students from minority ethnic groups ☐

A student that comes or is considered to come from a different ethnic group than biggest group in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.

d. Gifted students ☐

Gifted students are students who have special abilities for their age (e.g. intellectual, musical, or athletic)

e. Students from poorer families ☐

f. LGBTQI+ students ☐

LGBTQI+ stands for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex people.

g. Female students ☐

h. Male students ☐

i. Students of minority religions ☐

Students whose religion is not very common in this country

j. Students from a migrant background ☐

Students who were born in a country that is different from the country in which they go to [school] or students with at least one parent who was born in another country

k. Other groups of students: [please describe]

1.2 INNOVDIAG. Do you think changing any of the following things could help students with learning difficulties or with more disadvantages at your [school]?

Disadvantaged students might face extra challenges because they come from, for example, a minority background or identity, or from poorer family backgrounds.

	Yes	No	Don't know/not relevant
a. The way [teachers] teach	☐	☐	☐
b. The way we are assessed	☐	☐	☐
c. [School] rules (discipline, etc.)	☐	☐	☐
d. The way [school] communicates with students or parents	☐	☐	☐

e. The type of support [school] gives students	☐	☐	☐
f. After-school tutoring	☐	☐	☐
g. Mandatory peer-learning groups within the school	☐	☐	☐
h. Access to the internet for all	☐	☐	☐
i. Other (please specify)	☐	☐	☐

1.3 PSTINN. Did your [school] change any of the following in the last two years to better help or include disadvantaged students

Disadvantaged students might face extra challenges because they come from, for example, a minority background or identity, or from poorer family backgrounds.

	Yes	No	Don't know/not relevant
a. The way [teachers] teach	☐	☐	☐
b. The type of assignments	☐	☐	☐
c. [School] rules (e.g. discipline)	☐	☐	☐
d. The way the [school] communicates with students or parents/custodians	☐	☐	☐
e. The type of support the [school] gives students	☐	☐	☐
f. After-school tutoring	☐	☐	☐
g. Mandatory peer-learning groups within the school	☐	☐	☐
h. Access to the internet for all	☐	☐	☐
i. Other (please specify)	☐	☐	☐

1.4 FLALRC. In the last year, have [teachers] introduced (new) teaching and learning practices in the following areas:

	Yes	No	Don't know
a. New ways to do assignments and assessments	☐	☐	☐
b. Encouraging students to try different kinds of learning methods	☐	☐	☐
c. Using different teaching methods (for example, explaining things in different ways)	☐	☐	☐
d. A focus on developing creativity *Creativity means coming up with new ideas and solutions*	☐	☐	☐
e. A focus on developing critical thinking *Critical thinking means questioning and evaluating ideas and solutions*	☐	☐	☐

f. Collaborative projects in [class]	☐	☐	☐

1.5 INOINP Does your [school] ask you to give feedback in the following ways before introducing new activities, rules, processes or materials?

Please select all that apply.

a. Surveys or filling out a form ☐

b. Focus groups ☐

A focus group is a group interview with a small number of people. This group interview helps understand how people feel or what they think about certain topics.

c. Pilot testing ☐

A pilot test is a test of new activities, rules, processes or materials with a (small) group of people. The pilot test helps to understand if and how these changes would work (for example, how much they would cost, how long they would take etc.) The main purpose is to improve on the new activities, rules, processes or materials before introducing them to the whole [school].

d. Give written feedback ☐

e. Discussing it in [class] ☐

f. I am never asked to provide feedback on new activities, rules, processes or materials ☐

1.6 INEVAL Does your [school] ask you to give feedback in the following ways after introducing new activities, rules, processes or materials? *Please select all that apply*

g. Surveys or filling out a form ☐

h. Focus groups ☐

A focus group is a group interview with a small number of people. This group interview helps understand how people feel or what they think about certain topics.

i. Pilot testing ☐

A pilot test is a test of new activities, rules, processes or materials with a (small) group of people. The pilot test helps to understand if and how these changes would work (for example, how much they would cost, how long they would take etc.) The main purpose is to improve on the new activities, rules, processes or materials before introducing them to the whole [school].

j. Give written feedback ☐

k. Discussing it in [class] ☐

l. I am never asked to provide feedback on new activities, rules, processes or materials ☐

PART II - Practices

2. Teaching and learning

2.1 STABEH. To what extent do you agree with the following statements about your [teachers]

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. [Teachers] care about my learning	☐	☐	☐	☐	☐
b. [Teachers] encourage me to work hard	☐	☐	☐	☐	☐
c. [Teachers] encourage me to ask questions and participate in discussions	☐	☐	☐	☐	☐

d. [Teachers] really listen to what I have to say	☐	☐	☐	☐	☐
e. [Teachers] treat all students the same	☐	☐	☐	☐	☐
f. [Teachers] pay attention to students according to their learning needs	☐	☐	☐	☐	☐
g. [Teachers] provide more support to students who need more attention	☐	☐	☐	☐	☐

2.2 CLAENV. To what extent do you agree with the following statements about your [studies].

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. There are opportunities in [class] to talk about poverty and inequity *Inequity means that your chance to succeed in [school] or in the community or country is related to your background, such as how much money your family has or the colour of your skin.*	☐	☐	☐	☐	☐
b. There are opportunities in [class] to talk about different forms of diversity (gender, ethnicity, sexual orientation, disability, etc.) *Gender is a word that is used to talk about how people express masculine traits (traits most people think of as male) or feminine traits (traits most people think of as female) Gender is often mistakenly used for a person's sex (male or female) but this word only means someone's biology (body parts.* *Sexual orientation means who someone loves/is attracted to (of any gender)* *Ethnicity refers to the group someone is a part of that shares a common language, traditions, ancestry, history, and so forth.*	☐	☐	☐	☐	☐
c. [Teachers] use positive examples of ethnicities, cultures, and backgrounds that are like mine *Ethnicity is defined under item b.*	☐	☐	☐	☐	☐
d. I see myself as a valuable member of the [classroom]	☐	☐	☐	☐	☐
e. I have chances to help decide what is best for the [class] or [school]	☐	☐	☐	☐	☐
f. I feel **unable** to share my views in [class] related to my background	☐	☐	☐	☐	☐
g. I feel that few teachers and students understand people with my background	☐	☐	☐	☐	☐

2.3 POVINC. To what extent do you agree with the following statements about access to teaching and learning at your [school].

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. Students can participate in all [school] activities regardless of how rich their parents/guardians are	☐	☐	☐	☐	☐
b. All students in my [school] have the same opportunities in their life	☐	☐	☐	☐	☐
c. Students whose parents/guardians have less money still get all the [school] supplies they need	☐	☐	☐	☐	☐

3. School environment

3.1 DISPOL. To what extent do you agree with the following statements about [school] rules and disciplinary actions?

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. Students are treated the same when they break the rules at this [school]	☐	☐	☐	☐	☐
b. I know I would receive the same punishment as others for breaking [school] rules	☐	☐	☐	☐	☐
c. Teachers try to prevent discipline problems in class	☐	☐	☐	☐	☐
d. When students break rules, the school prefers to find ways to repair harm done and improve/repair relationships (for example with referrals to school counsellors, meetings with students and parents, compensation for injury or loss, and community service)	☐	☐	☐	☐	☐

3.2 BULPOL. Please indicate to what extent you agree with the following statements about bullying and harassment.

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. The [school] takes appropriate action if an incident is reported to them	☐	☐	☐	☐	☐
b. Students at this [school] will do something when they see bullying or harassment	☐	☐	☐	☐	☐
c. [Teachers] or other [faculty] at this [school] will do something when they see bullying or harassment	☐	☐	☐	☐	☐
d. Teachers or other faculty at this school will intervene if they hear negative comments on poverty, ethnicity, gender, sexual orientation or religion. *Gender is a word that is used to talk about how people express masculine traits (traits most people think of as male) or feminine traits (traits most people think of as female) Gender is often mistakenly used for a person's sex (male or female) but this word only means someone's biology (body parts.* *Sexual orientation means who someone loves/is attracted to (of any gender)* *Ethnicity refers to the group someone is a part of that shares a common language, traditions, ancestry, history, and so forth.*	☐	☐	☐	☐	☐
e. Staff in this school would never make or approve negative comments on poverty, ethnicity, gender, sexual orientation or religion. *See definitions of these terms under d.*	☐	☐	☐	☐	☐

PART III – Inclusive education

4. Inclusive institutional environment

4.1 WBSUPP. Do you agree that the following groups of students are supported well at your [school]?

[definitions of these terms are included at the end of the survey]

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know/not relevant
a. Students with special educational needs *Students with special education needs might need extra help at school because they have a disability or other face other challenges (such as depression) that makes it more difficult for them to learn.*	☐	☐	☐	☐	☐
b. Students whose first language is different from the language of instruction or a dialect of this/these languages	☐	☐	☐	☐	☐
c. Students from ethnic minority groups *A student that comes or is considered to come from a different ethnic group than biggest group in the country. An ethnic group is a group of people who have similar traditions, ancestors, languages, history, culture, religion, etc.*	☐	☐	☐	☐	☐
d. Gifted students *Gifted students are students who have special abilities for their age (e.g. intellectual, musical, or athletic)*	☐	☐	☐	☐	☐
e. Students from poorer families	☐	☐	☐	☐	☐
f. LGBTQI+ students *LGBTQI+ stands for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex people.*	☐	☐	☐	☐	☐
g. Female students	☐	☐	☐	☐	☐
h. Male students	☐	☐	☐	☐	☐
i. Students of minority religions *Students whose religion is not very common in this country.*	☐	☐	☐	☐	☐
j. Students from a migrant background *Students who were born in a country that is different from the country in which they go to [school] or students with at least one parent who was born in another country*	☐	☐	☐	☐	☐
k. Other (specify)					

4.2 WBTYPE. To what extent do you agree with the following statements about your [school]?

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
a. The [school] supports me academically	☐	☐	☐	☐	☐
b. The [school] supports my physical health	☐	☐	☐	☐	☐
c. The [school] supports me emotionally	☐	☐	☐	☐	☐
d. The [school] supports me socially	☐	☐	☐	☐	☐

5. General information

5.1 YEAR What year of study are you in?

Year: _____

5.2 AGE How old are you?

Age: _____

5.3 SEX What is your sex?

a. Male ☐
b. Female ☐
c. Prefer not to answer ☐
d. Other (please specify): _____

5.4 EDULEV What is the highest level of schooling of your parents or guardian(s)?

a. Less than secondary school ☐
b. High school graduate ☐
c. University degree ☐
d. Don’t know ☐

Definitions

Terminology	Definition
Diversity in Education	Diversity in education is about the effort to include or involve people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc. Diversity has a lot of different aspects and might be related to physical aspects and/or immaterial ones such as cultural practices, and makes sense according to the boundaries defined by groups of individuals.
• Gifted students	Gifted students are students who have special abilities for their age (e.g. intellectual, musical, or athletic).
• LGBTQI+ students	The LGBTQI+ acronym refers to lesbian, gay, bisexual, transsexual, queer and intersexual people. The "+" is often added to include people who do not self-identify as heterosexual and/or cisgender but who would not apply the LGBTQI+ label to themselves either. Gender is a word that is used to talk about how people express masculine (traits most people think of as male) or feminine (traits most people think of as female) traits. It is commonly used for a person's sex (male or female) but this word only means someone's biology (body parts). Sexual orientation means who someone loves/is attracted to (of any gender)
• Students from a migrant background	People are considered to have an immigrant background or to have an immigrant-heritage if they or at least one of their parents was born in a country that is different from the country in which they go to [school]. The terminology "students from a migrant background" will be used for all students with an experience of migration, i.e. immigrants, asylum seekers, refugees, internally displaced peoples, etc.
• Students from minority ethnic groups	A student that comes or is considered to come from a different ethnic group than the majority population in the country. An ethnic group is a group of people who share characteristics that distinguish them from other groups such as a common set of traditions, ancestry, language, history, society, culture, nation, religion or social treatment within their residing area.
• Students with special education needs (SEN)	"Special education needs" is a term used to describe the broad range of needs of students affected by learning disabilities, physical impairments and/or who suffer from mental disorders. SEN are categorised into three broad groups in this survey.
• Learning Disabilities	Learning disabilities are disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, co-ordinate movements, or direct attention. The most common Learning Disabilities are: Dyslexia, Dyscalculia, Dysgraphia, and Auditory Processing Disorder (APD).
• Mental disorders	Poor mental health can be both a consequence of lack of support for students experiencing disabilities and impairments, as well as a distinct medical condition hampering students' academic progress and broader well-being. The most common mental health conditions affecting children in school include: developmental disorders, such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder and Tourette's Syndrome; Depressive Disorders; Anxiety Disorders; Disruptive, Impulse-Control and Conduct Disorder (Oppositional defiant disorder - ODD, Conduct Disorder).
• Physical impairments	Physical impairments affect the ability of individuals to access physical spaces due to reduced mobility or to access information that is delivered in specific ways: visual delivery for visual impairments and voice/sounds for hearing impairments. The most common physical impairments are: Mobility impairments, Visual impairments, and Hearing impairments.
Student well-being	The project focuses on different dimensions of individual student well-being: academic, psychological, social, physical and material well-being. Well-being means how you feel about yourself and your life. Have good well-being usually means being comfortable, healthy, or happy.
Disadvantaged students	Disadvantaged students tend to need extra support to overcome

	challenges they face for a variety of reasons, such as a minority background or identity, or being from poorer family backgrounds.
Creativity	Creativity means coming up with new ideas and solutions. It involves: • Making connections to other concepts and knowledge from the same or other disciplines; • Generating and playing with unusual or radical ideas; • Producing, performing, or envisioning a meaningful output that is personally novel; • Reflecting on the novelty of the solution and its possible consequences.
Critical thinking skills	Critical thinking means questioning and evaluating ideas and solutions. It means: • Identifying and question assumptions and generally accepted ideas or practices; • Considering several perspectives on a problem based on different assumptions; • Being able to consider other theories and perspectives.
Bullying	Bullying is the repeated use of one's strength or popularity to injure, threaten, or embarrass another person on purpose. Bullying can be physical, verbal, or social.

Annex 5.E. Post-survey workshop on innovation and equity: From self-reflection to action

This Annex proposes some ideas for the organisation of a workshop that will allow everyone to compare and confront their views with others, have a collective reflection at the institutional level. This input could then be followed up by an action plan designed by institution leaders and other stakeholders to change or improve their current practices geared to improve equity within the educational institution – or introduce new ones.

Post-survey workshop

This workshop is created as part of the self-reflective surveys on innovation for equity in education. A self-reflection exercise comprising of students, teaching staff and school leaders likely brings up expected and unexpected challenges and opportunities, hence, the workshop is a proposed second phase to engage with such views. Primarily this workshop provides an opportunity to have a structured discussion about these insights and potential avenues to delve deeper into root causes, brainstorm on areas and pathways for improvement, and formulate plans to exact change. Additionally, the workshop also serves as an opportunity to have an open discussion with stakeholders at the school to be heard and engage in one of the major challenges in education: equity.

The workshop is intended to take about half a day to run, and would need a couple facilitators who take the lead in organising and guiding participants through the process. There are a number of open questions provided below that could serve as a guidance to exploring the challenges and opportunities around educational equity at your [school]. The results of these brainstorming questions below should then become departure point of innovations or policies implemented at your [school]. Given the exploratory state of this proposed workshop, further workshops could be held to continue discussions or delve deeper into actionable plans to improve equity at the [school].

This document comprises of two sections. The first section outlines several relevant areas to consider for the organisation of a half-day introductory workshop and gives some examples of activities that [schools] could use, further elaborate or modify. The second section discusses pathways to continue the work from

the first workshop in further meetings. Moreover, this document will also outline guidance for the workshop organisers in terms of the planning and set-up of the workshop activities.

It is key to keep in mind that the outlined proposal should be matched the context and needs at your [school] and may need to be tweaked. The terms used in this document may need to be explained or fit to the cultural, country or school context as well. The examples of activities below are organised by topic as covered in the self-reflection survey. These suggestions might serve as building blocks or points of departure. You might want to ask further questions, adapt them, or only focus your workshop on areas that require more attention at your [school]. Please note that timings are indicative as they depend on the size of the group of participants.

The introductory workshop

1.1. Pre-workshop considerations

There are a couple factors to keep in mind when setting up the workshop. Importantly, the workshop should be run with ample, undisturbed time – preferably as an afternoon. Participation should be voluntary but encouraged, for example, by ensuring that it does not clash with class preparation, review of student work, or exam preparation time. During the workshop, it will be helpful to have a space where it is both possible to address all participants, and have smaller breakout groups for discussion. These breakout groups could sit anywhere, but particular consideration should be given to not sit them too close to each other. These discussions should be independent and open.

To help ensure the ideas are as free-flowing as possible, it is key to mention to participants that normal hierarchy need not apply. Student and staff contributions should not be adapted or withheld due to concerns over how their managers (or teachers) might perceive them. To ensure this, we encourage the first round of breakout groups to be in-group (e.g. only students, (teaching) staff, or [school] leadership) to get a strong set of brainstormed suggestions. The second round of breakout groups, however, should take place in mixed groups, and for this exercise the open environment is key to stress and establish.

In trying to invite participants, it is also advisable to go beyond “usual suspects” for participation. Not only (teaching) staff and students who usually participate, e.g. through student council or school councils should be encouraged. The discussions about equity will benefit from a diverse set of participants. Hence, inviting a wide variety of students and (teaching) staff is key. Participation might be encouraged in manners appropriate to the context of the [school] – for example by finding a way for students to put participation on their CV or college applications, by offering refreshments, or by counting (teaching) staff participation as working hours or overtime. On top of this, finding the right time of day and the right time in the semester is important. It might also help to personally invite some students and (teaching) staff who might have interesting ideas but are not often represented in official settings.

1.2. The workshop proceedings

During the workshop, it might be necessary to talk about the concepts that are included in the workshop. There are definitions of these concepts included in the self-reflection surveys, but some of these might be quite conceptual and benefit from further discussion of explanation.

Given the varied discussion topics in this workshop, it might be advisable to let participants choose their topics for both activities. Keeping in mind a relatively equitable division between groups, you could invite people who you know have an interest in specific topics as well. If it looks like interest-based grouping will create groups too skewed in size, you can also see if some participants are willing to redistribute themselves. You can of course also decide to divide people into groups yourself if you feel this would contribute to a smoother running of the workshop, and/or save time.

Participants may be divided into groups of about five to seven participants. Smaller than that may reduce the input in the discussions, but groups larger than seven is likely to result in some participants taking a back seat. Given the importance of an inclusive approach to this topic, it is key to ensure each participant gets the opportunity to voice their opinions.

The groups for the second, in-depth activity should come from the brainstorm groups covering those topics. Groups can divide their own team members across these topics, but moderators or administrators can also take on this role of they prefer. The benefit of allocating people in this way is that they can bring their group discussion to the in-depth conversation.

As preparation for the workshop activities, it is important to ensure a couple things are available to participants in the breakout groups, namely:

- large whiteboards to write on and/or large sheets of paper. It is preferable that each topic is documented separately so that it can be used as input for the second round of activities
- Sticky notes might be helpful in ordering some of the processes in activity 2
- Markers, preferably in different colours, to help participants write and colour code if they like

Workshop content

Throughout the workshop a couple key things should be kept in mind. First, there might need to be multiple administrators to answer any questions or help groups as they are stuck. Groups are supposed to run their brainstorm or activities themselves: including the division of labour (e.g. by asking someone to write, perhaps ask somebody to keep an eye on moderating). However, given the difficulty of some of the concepts at the heart of these discussions, it is good to have some help available if participants need it.

Secondly, it is key to emphasise that there is no bad idea as part of this discussion. People can provide whatever suggestions they want, as the purpose is to think collectively about these topics and good ideas can come from anybody.

2.1. Workshop introduction

Opening activities aim at participants getting to know each other, and feeling comfortable to share views among each other, getting a sense of the motivations to participate, and outlining the context of the discussion in the [school] based on the results of the self-evaluation survey. These activities can be of various types (a web search using the keywords “icebreaker” or “warm up activities” allows finding a wide range of such activities). Some examples of opening activities are presented below.

Opening activities can be followed by a general presentation of the project and the results of the first stage of the self-reflection on equity: the survey.

Time	Session	Description
15 to 45 minutes	Getting to know each other (particularly relevant when participants do not know each other well and for large groups)	Icebreaker example: ask participants to present themselves to the group by answering a number of questions, such as your motivation to join the workshop, your position and focus in the school e.g. courses taught or followed.). Original questions could be used to create a friendly and informal climate, these can be related to the topic of the workshop, but not necessarily: - Can you introduce yourself and state one thing the others do not know about you? - What were the 3 cities that you most liked to visit and why? - What are your main expectations with regard to this exercise to work on equity at your [school]? - What is one key takeaway you have from filling out the self-reflective survey? - Which single word would best describe your vision of equity?

Time	Session	Description
20 minutes	Context of the workshop	• Explanation of the purpose of the survey and workshop, why the [school] participates, and what the goals are from the [school]’s perspective. • Presentation of the results from the self-reflection survey. These results should mainly focus on the general results, but it might be important to also highlight some surprising outliers.

Time	Session	Description
10 minutes	Explanation of the workshop proceedings	• Outline the content of the workshop, namely: a first brainstorm on the different areas surrounding equity as covered in the survey, and then in-depth discussion about proposed changes or solutions. • As a reminder, the topics covered in the survey are the following: (1) Main achievements of school around improving equity (2) Teaching staff support for disadvantaged students

		(3) The role of administrative practices in equity (4) Student support practices to improve equity (5) Knowledge sharing and learning practices for equity (6) Overcoming obstacles to improving equity (7) Possible improvements to facilities, space usage or software (8) The process of introducing changes to improve equity (9) Well-being of disadvantaged students • Question and answer with participants

2.2. Workshop activities

The workshop activities are intended to serve as moments to brainstorm about the questions and topics contained in the survey. These activities are meant to be open and inclusive – good ideas can come from any source. The first round of these activities are to brainstorm ideas in groups, and the second will be to deep-dive into the suggestions that came up in the brainstorm, specifically around the process that could be followed, the necessary elements to make it successful, and so forth. A couple of these questions will be geared specifically to teaching staff, school leaders and administrative staff, and as such, students do not need to be represented in those groups. However, including them is not a problem and may provide the benefit of outside perspective.

Time	Session	Description
1 hour	Brainstorm on the key survey topics	• For this activity, it is helpful to divide participants into groups: these groups should be uniform, namely, student-groups, teaching staff groups, and groups of school leaders and administrative staff. These groups do not need to be very large. • The size of the participant group should determine how the topics are divided. You could choose to allocate three topics per group or two topics per group. Three might be a more efficient use of time, but if you feel the topics may benefit from longer discussion (e.g. due to very rich survey results), two topics might be the better choice. If there are enough participants, you could try to double up on topics (i.e. each topic gets covered by two groups). In the last case, it would be wise to stratify topics by ensuring two groups do not cover the same set of topics (e.g. not two groups covering topic 1, 2, and 3). • The best use of this hour is to use 20 minutes per topic. • It might be preferable to let participants choose the topic groups they'd like to join, but if it looks like groups might be too skewed in size, you might need to redistribute some participants. Of course, you can also allocate groups if you feel that will make the process more smooth. • It is recommended to give participants a board to write on or have large sheets of paper with sticky notes or markers.

The topics, and associated questions are listed below. Questions that are not key for students to participate in are colour coded in yellow.

(1) What do you see as the main achievements of your [school] to improve equity in the past 2 years?

(2) Do you have ideas for how to support teaching staff to further personalise their teaching and learning to the needs of disadvantaged students?

(3) Which administrative practices could be changed to contribute to educational equity within your [school] (admission, school discipline, student guidance and counselling, etc.)?

(4) Which of your student support practices could you change to further equity in your [school] by creating a learning environment wherein all kinds of students with diverse personal backgrounds, abilities, characteristics and identities safely interact?

(5) Which knowledge and learning practices could you change or introduce to make information about effective practices continuously shared within your [school] and make other staff reflect on how their practices could improve educational equity? These effective practices should mainly centre on how to improve the academic learning and well-being of students with special education needs, low socio-economic status or minority backgrounds.

(6) How could you overcome some of the current obstacles that limit your ability to introduce new practices to improve educational equity?

(7) Are there additional improvements to the [school]'s facilities, new uses of the space or new types of equipment or software that could better meet the needs of some disadvantaged students or allow for more activities to support equity and inclusion?

(8) What actions do you think are needed to improve processes through which new practices, new forms of support or new materials are proposed in your [school]?

(9) Are there additional improvements to the [school]'s programmes and other support towards the well-being of specific groups, or of specific types of well-being that could improve equity and inclusion?

Time	Session	Description
1 hour	In-depth discussion of improvement strategies	• After the brainstorm from activity one, collect the suggestions per topic. These will form the basis of in-depth discussion in this activity • Create mixed groups of students, teaching staff, administrative staff and school leaders around topics. Each group should focus on one topic if possible. In large groups, you may make bigger groups or make two groups per topic. In case of very small participant numbers, you may choose to focus only on topics with particularly rich discussions in activity 1 and/or with particularly striking insights from the survey. • For these discussions it is key to have material to write on. Try to nominate a note-taker per group or give them recording devices. Moreover, each group should have a whiteboard or a large sheet of paper to write on, e.g. using sticky notes or markers.

It is possible that you do not manage to discuss all suggestions from the brainstorm – that is ok. However, it is important not to dismiss ideas before thinking through them using this process. Perhaps not all ideas are feasible, but talking through where issues might lie might bring about alternative solutions, help adapt ideas, provide context as to why things are not possible or even just spark an interesting conversation on the topic.

The questions at the heart of this exercise are listed below. Questions that are not key for students to participate in are colour coded in yellow.

(1) This activity builds on the ideas for how to support teaching staff to further personalise their teaching and learning to the needs of disadvantaged students from the brainstorm, but you can also use new ideas you may have while working on this. Looking at these ideas, consider the resources at [school] (staff, learning materials, budget, time) – what would these ideas require? How could these resources be used realistically to put these ideas into practice? Would these ideas be implementable in the next year, or would they require a longer-term plan?

(2) This activity builds on the ideas for changes in administrative to contribute to educational equity within your [school] (admission, school discipline, student guidance and counselling, etc.) from the brainstorm, but you can also use new ideas you may have while working on this. Looking at these ideas, try to consider how these practices can be changed in practice, what is necessary to change them, and what the implications of those changes may be. Try to think of how to make (some of) these changes happen in the next year. How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(3) This activity builds on the ideas for changes in student support practices to further equity in your [school] by creating a learning environment wherein all kinds of students with diverse personal backgrounds, abilities, characteristics and identities safely interact. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. While thinking through these topics, think of the resources that would be required for these changes – what is available at the school and how could this be used to exact these changes? Are there any new resources needed? What is necessary at the school to implement these support practices – try to think of these as a list of things that need to happen (put into order). Try to think of how to make (some of) these changes happen in the next year. How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(4) This activity builds on the ideas for changes in or the introduction of knowledge and learning practices to make information about effective practices continuously shared within your [school] and make other staff reflect on how their practices could improve educational equity. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. While thinking through these topics, think of the resources that would be required for these changes – what is necessary to improve the knowledge flows and learning opportunities at this [school]? Are there any new resources needed? How can the resources at [school] be used more effectively? Are there changes in rules or processes that may help with this? What is necessary at the school to implement these changes – try to think of these as a list of things that need to happen (put into order). Try to think of how to make (some of) these changes happen in the next year. How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(5) This activity builds on the ideas on how to overcome some of the current obstacles that limit your ability to introduce new practices to improve educational equity. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. While thinking through these topics, think of the resources that would be required for these changes – what is necessary to reduce obstacles to introduce new practices around equity at this [school]? Are there any new resources needed? How can the resources at [school] be used more effectively? Are there changes in rules or processes that may help with this? What is necessary at the school to implement these changes – try to think of these as a list of things that need to happen (put into order). Which changes could already be implemented right now? How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(6) This activity builds on the ideas for additional improvements to the [school]'s facilities, new uses of the space or new types of equipment or software that could better meet the needs of some disadvantaged students or allow for more activities to support equity. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. While thinking through these topics, think of the resources that would be required for these changes – what is necessary to improve facilities, find alternative uses for the space or introduce new types of equipment or software for better equity at this [school]? Are there any new resources needed? How can the resources at [school] be used more effectively? What is necessary at the school to implement these changes – try to think of these as a list of things that need to happen (put into order). Which changes could already be implemented right now? How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(7) This activity builds on the ideas for improvements to processes through which new practices, new forms of support or new materials are proposed in your [school]. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. Group your ideas by type of action and by ease of implementation. While thinking through these topics, think of the resources that would be required for these changes – what is necessary to improve the process through which to propose new solutions at this [school]? Are there any new resources needed? How can the resources at [school] be used more effectively? What is necessary at the school to implement these changes – try to think of these as a list of things that need to happen (put into order). Which changes could already be implemented right now? How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

(8) This activity builds on the ideas for additional improvements to the [school]'s programmes and other support towards the well-being of specific groups, or of specific types of well-being that could improve equity. These ideas will stem from the brainstorm, but you may also use new ideas you have while working on this. While thinking through these topics, think of the resources that would be required for these changes – what is necessary improve [school] programmes and other support to improve the well-being of disadvantaged students? Are there any new resources needed? How can the resources at [school] be used more effectively? What is necessary at the school to implement these changes – try to think of these as a list of things that need to happen (put into order). Which changes could already be implemented right now? How could these processes be further improved over time? What sequence of actions would need to be taken? Which changes would take longer?

2.3. Conclusion of the workshop

The last activities should aim at concluding the workshop, reflecting on what has been learnt, answering remaining questions and discussing next steps. A room discussion can be a relevant format for this exercise.

Time	Session	Description

45 minutes	Plenary discussion of the activities	• Each group will be asked to give a brief overview of their discussion in the second activity
		  • Briefly detail two ideas you have run through the questions
		  • What are the main takeaways from this discussion?
		• A general discussion about the workshop results
		  • What have you learnt during this workshop?
		  • Are there things you would personally like to continue to work on from this workshop?
		  • What are direct “needs” to work on improving equity in your opinion?
		• This is also a moment to ask any additional questions participants may have

Time	Session	Description
15 minutes	Conclusion and next steps	• A description by the administrators of what the [school] would like to do with the results: how will this work be taken forward? • A discussion of the process: • E.g. Did you like the format? Should any changes be implemented in possible future workshops? • Thanking the participants for their time and input, concluding the session, and collecting notes (or recording devices) to create a base of resources from this workshop.

Guidance for recurring activities following this workshop (optional)

In addition to the workshop, schools may want to continue these discussions in various ways. Different approaches can be considered to continue the work on improving equity based on the survey and workshop:

- Follow-up meetings and workshops: additional workshops can be organised at regular intervals with participants to further consider avenues to improve on equity within the [school]. These workshops may centre around particular topics specifically, or may target particular stages of the process of changing practices, processes or materials at the [school]. Follow-up meetings and

workshops can also be a useful way to have varying participation (i.e. keep “registration” open) and ensure an inclusive approach to thinking through these issues. These workshops can also be an opportunity for feedback on the progress made by, for example, [school] leadership in carrying out some of the work that has come up during the survey and workshop.

- Encouraging the emergence of a working group on improving equity: Another way to move forward with this work with continual input from a broader set of stakeholders is to encourage the creation of a working group. This could be an open call to ensure people can join who could not go to the workshop, but encouraging the participants in the workshop to join this working group is also key. Very important to keep in mind is to ensure a diverse set of people in the group, representation from all stakeholders, and a flat hierarchy. If [school] hierarchy is maintained in such a process, the risk is that the ideas will come from leadership only, which might limit buy-in and the effectiveness of the solutions for the target groups. Throughout this process, it might also help to seek consultation on intermediate outputs or plans from the larger community (including parents/guardians) to seek feedback and room for improvement.

6 Survey implementation: a brief overview

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This chapter provides a brief overview of how to implement the three types of innovation questionnaires prepared for this report. National surveys are likely to be implemented by experts from National Statistical Offices, who are probably familiar with the issues and concepts discussed in this chapter. This chapter is mainly designed to be of value for the leaders of educational institutions who wish to implement one of the three questionnaires in their own institution, but some details are also provided for larger-scale surveys at the regional or district level. The chapter outlines best survey practices and provides guidance on logistical challenges and advice on avoiding pitfalls.

This final chapter provides a brief overview of how to implement the three types of questionnaires prepared for this report (chapters 3, 4, 5). National surveys are likely to be implemented by experts from National/Regional Statistical Offices, who are probably familiar with the issues and concepts discussed in this chapter. The chapter is thus mainly designed to be of value for the leaders of educational institutions who wish to implement one of the three questionnaires in their own institution. Some details are also provided for larger-scale surveys at the regional or district level. The chapter outlines best survey practices and provides guidance on logistical challenges and advice on avoiding pitfalls. Additional details on how to run a survey are available in Chapter 9 of the Oslo Manual (OECD/Eurostat, 2018[1]) as well as in other sources, for example (Fink, 2003[2]).

Most commonly, surveys have a statistical purpose. They try to provide statistically representative data about a given phenomenon (here, innovation) that accurately represent its manifestations for a specific population of interest. This requires either a census or a random sample and a protocol to maintain representativeness and maximise response rates. The implementation of the main innovation questionnaire (chapter 3) at the regional or district level is likely to require representative data.

Statistical surveys will typically be organised by the region or district, with the goal to obtain information from representative samples of schools, teachers, and students. The sampling method can use a random sample of schools, in combination with randomly selected strata (classrooms) within schools. If schools or classrooms have contrasted characteristics, those samples should be stratified so as to randomly represent these characteristics (for example small and large schools). If contact data are available, it is also possible to randomly sample all teachers and school leaders within a region. In either case, the sample needs to be sufficiently large to minimise standard errors or chance variations in the results.

If the questionnaires for students are used, the most practical option is to sample institutions because contact data for individual students may not be available or accessible, due to privacy regulations.

While all surveys in this report could in principle be used for statistical purposes, two of them were also designed to be of value at the institution level (innovation culture and innovation for equity), They can be used for self-reflection and data could be collected at the school level, particularly if they are followed up with a workshop or other forms of additional school level discussion. While ideally this should involve efforts to have high response rates, they can be used to start a dialogue even if they are not fully representative of all institution stakeholders.

Research surveys should typically obtain informed consent from all respondents, who should also be informed about the use and objectives of the collected data and respect regulation about the collection and storage of personal data. When carried out for operational purposes at the school level, some of these obligations (or good practices) may not apply. Some statistical surveys are mandatory, in which case they do not require informed consent (although they should still provide information about the use of the collected data).

General protocol

Given the different groups involved, the survey protocol (the rules for conducting the survey) needs to ensure that all participants can fill out the questionnaire at convenient times and steps are taken to minimise non-participation and biases from participants speaking to each other about the survey before everyone has completed their questionnaires. Even with buy-in from school staff, a protocol is required to outline the incentives and methods to ensure the security and validity of the data and to minimise problems that can thwart successful data collection.

The protocol will differ depending on which groups are surveyed. The protocol will be much simpler if only school leaders and teachers are surveyed, since these two groups can provide consent themselves and it should be possible to obtain contact details for them if the survey is conducted at the regional or district

level. If students are involved, questionnaires will need to be distributed within classrooms. Minor students should require the consent of a parent/guardian (and ideally their own consent too). The instructions given in this section can be used to develop the protocol for a regional/district level survey or a school-level survey.

The best practice for regional or district surveys is to send invitation letters and questionnaires to named respondents, for which contact details such as an email address for an online survey, or a postal address for a mailed survey, are available. This data permits follow-up for non-respondents and the calculation of response rates. This practice may be applicable for school leaders and teachers, but it is unlikely to be possible for students.

A basic protocol for an online or mailed survey of school leaders and teachers is as follows:

1. Send a letter of invitation that explains the purpose of the survey, the amount of time required to complete it, offers confidentiality, and describes informed consent. If the survey collects minimal personal details, such as age, gender, job position and highest level of education only, the letter can state that informed consent will be assumed if the respondent returns the completed questionnaire.
2. After approximately one week, send the questionnaire by post or an email that includes a link to the online version. The email should contain a confidential access code that is limited to the specific respondent. This is required for follow-up.
3. One to two weeks after the initial mail-out, send a one-page reminder letter to non-respondents.
4. Four to six weeks after the first reminder, send a second reminder letter. This should differ in wording from the first reminder.
5. Two weeks after the second reminder, send a third reminder letter or begin telephone reminder calls (if supported by the budget).

Implementation protocol when students are surveyed

Permission to conduct the survey may be required from senior managers at the regional or district level if the survey will be implemented at the school level and include students. For tertiary institutions, permission may be required from the head of the institution. Some countries require ethics approval for surveys by tertiary institutions, notably if they are conducted for research purposes (rather than as part of the operation of the institution). Institutional level surveys can also cover school leaders and teachers.

Large institutions such as universities and comprehensive high schools can use random samples of teachers and students or stratified random samples, such as by course. For smaller schools it may be easier to run a census, in which all teachers and students are asked to complete the questionnaire. In both cases, reaching a good response rate is important.

A survey at the institutional level requires an identified administrator at each school (or tertiary institution) that is responsible for distributing questionnaires to school leaders, teachers, and administrative staff (if included) and to students. This requires identifying a responsible person at each institution to co-ordinate data collection, identify contacts at the school, and facilitate preparations among school staff.

The responsible administrator has four main tasks: maintenance of a datafile (usually in Excel or other spreadsheet programme) of all activities to prepare and implement the survey, teacher/invigilator trainings, consent form distribution, and the preparation of survey packets. The datafile file (confidential) should include the names, contact details, and classroom or homeroom of all students and, for each, if a consent form was obtained and if the individual completed the questionnaire. To prevent biases in responses, the protocol for school-level surveys need to ensure that conditions are the same and that invigilators and teachers receive the same instructions and explanations to carry out the surveys. Teacher/invigilator

trainings are necessary if teachers are responsible for distributing questionnaires to students. In-person training for teachers should be conducted in each school approximately 1 to 3 weeks prior to data collection. Survey coordinators/facilitators will need to give teachers information about the survey administration process and parental/student consent procedures.

In many countries, consent will need to be obtained from school leaders, teachers, and students and/or parents (if students are minors). Depending on the legislation in the respective country, passive consent forms could be a strategy to limit non-participation. For instance, parents only fill out the form if they do not want their children to take the survey. In some countries, the legislation requires active consent (e.g. GDPR in the European Union). In addition to the national language, consent forms for students should be provided in the common minority languages spoken at home. Completed consent forms should be collected by the responsible administrator, who can use the information to determine the number of questionnaires and decoy booklets to be provided to each class and provide each teacher with a list of students to receive the questionnaire. Decoy booklets can be given to students who lack consent. The decoy booklets should be multipage scannable booklets with a cover and back identical to the survey but with other text instead of questions on the inside. Students who receive such booklets should be able to hold them at their desks without peers knowing if they did or did not participate, and why.

The responsible administrator will need to prepare survey packets before survey implementation. Packets for each classroom should include scripts for the invigilator, survey booklets, decoy booklets, pencils/pens and a classroom information form. These packets should be prepared using classroom-level rosters. The survey administration materials should be put in an envelope with a label attached to the top with school name, teacher name, class period, and number of students enrolled in the class. These survey packets should be delivered to teacher mailboxes (or a more logical place for teachers to get these envelopes if available) at least 1 day prior to survey administration.

On data collection day, the organising team needs to ensure teachers have necessary supplies and be ready to answer last-minute questions. Teachers or invigilators need to record information on the class-level information form, including the number of students that are registered for the class, and the number of students present during survey administration. Depending on the administrative organisation, teachers or invigilators could also fill out the number of students/parents who did not consent to participating in the survey. It may be easier to record this at a school-level and provide this information to the teacher or invigilator in advance. The person administrating the survey should distribute the surveys and read the script to students. The script should provide the context of the survey to the students and what is expected of them. Students should be reminded that the surveys are anonymous and that they should not write their names on the surveys.

While students fill out the survey, the teacher or invigilator may need to answer student questions, as some of the concepts covered in the survey may be confusing. School leaders and staff could complete the survey at the same time as students or at a separate time, for example by organising an hour after class time for all teachers to fill out the survey at once.

Surveys for school leaders, teachers and students can also be provided and completed online. Online completion removes the need for data entry after the questionnaires are completed, but requires additional administration. For students, the organising team will need to ensure that laptops or computer rooms are available for each classroom at specified times to fill out the surveys in-class. It is not advised to provide students with the option of remote completion, as this will result in much lower participation rates and prevent the participation of students without access to the internet and a computer. (Remote completion can more easily be used for school leaders and teachers, for which consent can also be obtained as they fill out the questionnaire.)

Paper questionnaires need to be collected after completion. Teachers must not look at the questionnaires or even appear to look at them. It may be preferable to arrange for one student to collect the questionnaires

(face down) and place them in an envelope before giving the envelope to the class teacher. These envelopes should be collected by an administrator.

Data analysis and interpretation

After collection, the data in paper questionnaires needs to be entered into a data capture programme that is specifically designed to look like the survey questionnaire, unless a machine-readable paper questionnaire is used. The next step is data analysis, which can use a common software programme such as Excel or dedicated statistical software such as SPSS or STATA. Data analysis needs to be done by individuals with experience with the chosen software. The basic requirement is to produce descriptive results such as frequencies (distribution of responses to each question) and cross-tabulations (distribution of responses by other variables of interest, such as student age, gender, etc.). Each question (other than questions requesting text data) must be assigned a numerical number. For instance, 1 for yes, 0 for no. Likert scales can be codes as 3 for high, 2 for moderate, and 1 for low importance. Missing data must be given a separate code from "don't know/not relevant" (a decimal point in SPSS), as don't know responses are interpretable survey responses. "Don't know/not relevant" responses should be coded as equal to -9 or -99 to prevent confusion with the scale used for Likert questions.

The descriptive analyses should explore the types of practices that are the least or most common and differences in answers by specific groups of participants. Differences in perceptions or opinions between different stakeholders can be used to identify differences between the intended effects of school policy (school leaders) and the perceptions of these effects in practice (teaching staff). Other opportunities to observe disparities between intended and experienced effects can be found by comparing student survey results with the answers of teachers and school leaders for those questions that are similar or identical across the different questionnaires.

The purpose of the preliminary analyses is to establish baselines and identify areas for improvement. These are innovation activities for the main innovation questionnaire, the innovation culture for the relevant questionnaire, and equity conditions for the equity questionnaire. It is important to develop "next steps" and recommendations based on the descriptive results. This can be supported by a short report that is heavy on graphs and visuals to communicate the observations and follow-on discussions of the results by teachers, school leaders and students, such as at a school assembly, or through a workshop, as for the equity questionnaire.

For regional or district level surveys, additional insights can be gained from linking survey data to school-level information from other databases, such as school performance on a range of indicators. The survey results could also be used for additional statistical analyses such as correlation, principal component, or factor analyses of the relationships between different innovation activities and outcomes of interest. Further observations could be made by connecting school level data with data for specific innovations, legislative or policy changes at the school or at a regional or district level, or data on the demographic and socio-economic characteristics of each school. Moreover, Crohnbach alpha reliability values, ANOVA and Bonferroni adjusted comparisons may be valuable if there is a case for comparative analyses between groups can be made.

The data for the equity survey can be analysed to identify results for specific groups of students, and to identify common denominators among activities that are frequently identified as important to change or improve equity. Other comparative insights could be gained from the differences in answers between teachers and school leaders. Both surveys are similar, and as such provide opportunities to compare perceptions of where opportunities and challenges lie in improving equity. These differences in perceptions or opinions can be used to identify differences between the intended effects of school policy (school leaders) and the perceptions of these effects in practice (teaching staff). Other opportunities to observe

disparities between intended and experienced effects can be found by comparing student responses with the answers of teachers and school leaders.

References

Fink, A. (2003), *The Survey Handbook*, Sage Publications, London. [2]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [1]

Part II Measuring educational innovation with big data

7 Measuring educational innovation through social media: An international exploration in the Twittersphere

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This chapter explores the possibilities to measure and analyse education innovation internationally using existing social media data. It proposes a method and a proof-of-concept regarding the measurement of the nature and intensity of exchanges around educational innovation using big data from a widely used social media: Twitter. Using social network analysis, it uncovers the nature of the networks that drive the discussion on educational innovation in Twitter, identifies the educational innovation areas that were discussed, and analyses the similarities and differences across three different languages and geographic zones: English, French and Spanish. The chapter points to the advantages (and limitations) of this method, notes how it could be expanded to other areas of interest, and illustrates how big data could be used for international comparative work.

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Introduction

The understanding of innovation is essential to the improvement of education. Developing the ability to measure and identify educational innovation and link it to its drivers and effects is a first step to refining and improving countries' innovation policies in the education sector. This could also support state and local education administrators in strengthening their improvement strategies and how they empower stakeholders to innovate.

Cumulative knowledge on educational innovation and educational innovation policy requires to establish and provide countries with indicators that can be regularly updated over time, and/or a robust methodology to develop those indicators. While this can partially rely on the use of existing international data sets, could be based on the development of new surveys, this also implies to analyse and better understand the drivers of innovation in the education sector, where countries stand in this area, and to expand the methodologies and data sources to measure innovation in an accurate and comprehensive way.

The OECD explored different ways to understand and measure important dimensions of the innovation process and output in education. The 2014 edition of *Measuring Innovation in Education* (OECD, 2014[1]) computed measures of innovation allowing the comparison of innovation in education and in other sectors of society – showing high levels of innovation in knowledge and methods in education (and particularly higher education) compared to other sectors, but lower levels in most other types of innovation. The 2019 edition of *Measuring Innovation in Education* (Vincent-Lancrin et al., 2019[2]) focused on identifying the introduction of new teaching and school practices as well as of significantly changed practices and highlighted a moderate level of innovation in the classroom and in schools as measured by the change in practices that are considered as the most important to explain learning outcomes in mathematics, science and literacy.

This chapter proposes a new methodological approach to use existing data to measure the nature and processes of innovation in education. Instead of working with statistically designed datasets, it works with "big data" that users made publicly available on the Internet. In this particular case, we use Twitter, a social media platform, to identify the nature of the discussion on educational innovation across linguistic areas (English, French and Spanish) as well as the structure of the networks. This approach casts new light on how educational innovation is discussed, spread and by whom in different countries and languages.

The first section of the chapter recalls what educational innovation means. The second section puts the proposed methodological approach in perspective by contrasting it with the "survey" approach. We then present "social media", the data and data analysis methodology before zeroing in on three separate analyses based on three different languages allowing the comparison of the "social networks" interested in educational innovation, the types of content related to educational innovation discussed across countries, but also the actors involved in sharing or re-sharing these ideas. In conclusion, we summarise the findings and draw the lessons of this methodology for further work in this area.

Conceptualising educational innovation

Innovation is crucial for individuals and societies to make progress and be able to face new and unprecedented challenges (Serdyukov, 2017[3]). This is true in education as in any other sector of society. However, innovation in education is more or less desired depending on time and stakeholders. For example, policy makers often suggest that educational systems are sluggish in adjusting to changes and often reluctant to innovation within a subjectively defined, reasonable amount of time. Yet, teachers and other educational professionals paint a different picture. From their perspective, there are too many – superficial – changes and supposedly innovations that are externally imposed on them in a top-down fashion without an indication of policy makers being (fully) aware of the circumstances in which teachers and pupils teach and learn (OECD, 2014[1]). Consequently, they often feel neglected in the process of

policy development and only partially supported in the practical implementation of policy recommendations and strategies (Ketelaar et al., 2012[4]; Lewin and Stuart, 1993[5]). The COVID pandemic has shown that education systems could innovate and adjust very quickly to new realities when forced to though – see (Vincent-Lancrin, Cobo Romaní and Reimers, 2022[6]; Thorn and Vincent-Lancrin, 2021[7]).

While a debate about how much, when and where innovation is needed exists, there still appears to be a common ground. All participating parties share the belief and conviction that educational systems are running up against a wide range of challenges that need to be addressed in order to provide the best possible education for younger generations. Furthermore, the scientific community already stipulated and provided empirical evidence that there is an increasing need for teachers to develop and implement new, collaborative, approaches to learning (Finsterwald et al., 2013[8]; Rehm et al., 2020[9]). Previous OECD reports suggested four reasons why educational innovation matters, namely educational innovations can i) improve learning outcomes and the quality of education, ii) contribute to the enhancement of equity and equality, iii) have positive effects of efficiency, and iv) update the educational system to keep track and not loose pace compared to societal and economic changes that are occurring simultaneously (OECD, 2014[1]; OECD, 2016[10]; Vincent-Lancrin et al., 2019[2]); see also chapter 2 of this report (Van Lieshout, Arundel and Vincent-Lancrin, 2023[11]).

When considering the improvement of learning outcomes, concepts like self-regulated learning (e.g. (Garcia, Falkner and Vivian, 2019[12]) and personalised learning experiences and environments (e.g. (Prain et al., 2013[13]) have been suggested. Exemplary educational innovations that may be able to enhance issues of equity and equality can be centred around the digitalisation of education (e.g. (McLay and Reyes, 2019[14]) and the resulting ability of pupils and students to more easily access information and produce their own learning materials – e.g. (Lech et al., 2017[15]). The concept of efficiency, while highly important from a socio-economic perspective, has often been disconnected from educational science and the realities of educational professionals (Serdyukov, 2017[3]). Moreover, scholars have generally suggested the existence of a "*productivity paradox*" – e.g. (Polák, 2017[16]), which suggests that the advancement of technology is not matched with proportional increases in the productivity of learning. Interestingly, this notion can be related to "cognitive load theory" – e.g. (Kalyuga and Singh, 2016[17]) from the realm of educational science. In a nutshell, this theory postulates that too much extraneous information, such as an overload of information from social media – e.g. (Choo et al., 2015[18]), distracts the working memory. As a consequence, people can easily feel overwhelmed by information that, in essence, might not necessarily contribute to the actual learning process. Furthermore, if the level of extraneous information is too high, people are more prone to fall back on their long-term memory, more easily digest confirmatory information and replicate their established routines. Consequently, the chances of engaging into transformative processes, which incorporate new and even challenging information, might be diminished. In the context of educational systems meeting the pace of broader societal changes, scholars have again indicated the need for schools to prepare pupils for the ongoing digitalisation of the workplace, in order to reap the benefits it brings, but also to deal with the eminent disadvantages and pitfalls – e.g. (Dumont, Istance and Benavides, 2010[19]; Schleicher, 2012[20]).

Generally, innovation can be defined as "*a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)*" (OECD/Eurostat, 2018[21]). Following the fourth edition of the Oslo Manual (OECD/Eurostat, 2018[21]), this definition can be simplified into two main types of innovation, namely, i) product and ii) process innovation. Product innovation refers to innovation in goods and services, which are often intertwined in the context of digitalisation. From an educational perspective, these take on the form of new educational resources, such as e-textbooks, or educational formats, including e- and blended learning scenarios. Process innovation refers to innovation in production processes or activities. Examples from the educational realm include innovative processes to organise professional development of teachers, or new ways to foster collaboration between educational

professionals. While these definitions provide a valuable basis for further considerations and conceptualisations, the practical ramifications are inherently difficult to measure.

Determining the degree of educational innovation – from surveys to social media

Generally, two approaches to measure and determine the degree of educational innovation are used.

First, the adaptation to the context of education of national innovation surveys, such as the EU Community Innovation Survey[1]. These tools are well established and have been used for decades in the private sector (OECD/Eurostat, 2018[21]). Moreover, there already have been efforts to adapt these survey to better represent the public sector, in general – e.g. (Bloch, Genicot and Ray, 2008[22]) , and the educational sector in more detail – e.g. (Haelermans, 2010[23]; Halász, 2018[24]; OECD, 2014[1]). In the latter case, the applicable studies often tried to relate the indicators for innovation to performance measures of pupils and students. This approach was adopted to develop survey instruments in the first part of this book.

The second broad approach to measure innovation is rooted in the assessment of organisational change. Here, survey tools are designed, distributed and analysed that deal with the dissemination of specific innovations in work practices, for example the introduction of (new) computers or organisational practices – e.g. (Greenan and Lorenz, 2013[25]). In contrast to the first approach, here the focus shifts more towards micro-level data and comparison of reports across time – e.g. (Adams Becker et al., 2018[26]). (OECD, 2014[1]) presents a possible implementation of this approach.

These approaches have undoubtedly contributed to our understanding of how educational innovations is introduced and implemented in practice. However, while innovations aim at improving something or offering new sets of opportunities to face challenges, there is no guarantee that a certain set of chosen changes or altered processes will indeed yield the envisioned results (Vincent-Lancrin, 2020[27]). Moreover, the two indicated types of measures tend to be summative and evaluate the situation after an educational innovation has been developed and implemented. This typically requires some time.

Involving all relevant actors already from the start of the underlying innovation process is considered key to successful innovation (Boahin and Hofman, 2012[28]; Ketelaar et al., 2012[4]; Prince Machado, Tenorio Sepúlveda and Ramirez Montoya, 2016[29]). To this effect, one of most widely used and simplest strategies is to engage communities through communication and collaboration, which involves accessing just in time information (e.g., news, ideas, approaches) and the exchange of information, knowledge, and strategies regarding the best practices from schools and communities (OECD, 2013[30]).

It is therefore important to also capture, monitor and evaluate the processes underlying the development and implementation of educational innovation – and to do it in real time if possible. Social media offers multiple parties (e.g. teachers and other educational professionals) the opportunity to start bottom-up initiatives and innovations (Rehm et al., 2020[31]; Rehm et al., 2020[9]; Rehm and Notten, 2016[32]). If educators and others feel marginalised from official policy processes and developments, they now have the possibility to publicly voice their concern and openly discuss both product and process innovations. Additionally, these same individuals are also able to exchange information, resources and experiences about the interplay between the top-down and bottom-up innovation. More specifically, educational professionals can easily discuss specific educational practices (e.g. video conferencing in times of home-schooling) using social media. They can also share views and best-practices on how they have been introduced and supported within their local settings, which forms the heart of innovation. For example, a recent study investigated whether these types of networks and communicative exchanges are able to exert real influence on (educational) policy processes. Investigating the national discussion on Twitter about the introduction of the Common Core in the United States, a science curriculum adopted in several US states, Supovitz and colleagues (2015[33]) suggest that informal networks in social media can have an impact on current affairs in the (educational) policy process.

Additionally, there has been a shift from government to governance in the past few decades (Ball and Junemann, 2012[34]). As a result, (horizontal) co-operation between the governmental bodies and networks of relevant actors (private/public) have become central. In particular, the network governance approach focuses on the informal, horizontal nature and mutual dependency between the various actors in the development and implementation of policy (Klijn and Koppenjan, 2012[35]). In these policy processes, governmental actors become facilitators and coordinators of discussions about policy processes (Pierre and Peters, 2000[36]). These discussions increasingly take place on social media platforms, such as Facebook and Twitter. This allows everyone who is interested to closely follow developments, share views and opinions, critically reflect on practice, and possibly assert influence on education policy processes (Cornelissen et al., 2011[37]). It is therefore of crucial importance to better understand how the underlying communication flows and patterns develop and evolve over time, as policy processes will gradually become more and more informed by discussions on social media.

Social opportunity spaces

The rise of social media has led to a panoply of online communication spaces or sites, such as Facebook, LinkedIn and Twitter, wherein individuals can engage into the latter type of activities and therefore engage into deliberative learning. On the basis of their structure and general characteristics, these platforms connect individuals via networked devices, such as computers (Wellman, 2001[38]). Consequently, these platforms are also referred to as social networking sites (SNS). Apart from recreational purposes (e.g. sharing holiday photos and pet videos), these spaces are increasingly used as places for professionals to meet and discuss current topics and problems relevant to their profession. Additionally, there has been a growing amount of research that investigated the potential of SNS for informal learning. Owen and colleagues (2016, p. 2[39]) postulate that social media provides teachers with a means to “scale-up their professional learning”. Moreover, a growing number of studies have shown that teachers use SNS, such as Twitter, to keep up to date with the latest news on education and share resources with colleagues (Risser, 2013[40]). This observation is paired with more theoretical considerations by scholars like Marotzki (2004[41]), who suggest that social media provides us with an unprecedented opportunity to exchange information and experiences, while connecting with other people and learning from and with each other.

These social media platforms essentially provide informal learning spaces that can initiate professional development processes (Spanhel, 2010[42]). However, in contrast to formal learning spaces, the focus here is not primarily on the acquisition and transfer of knowledge. Instead, it is rather a question of the "*contextualization, flexibility, decentralization, pluralization of knowledge and experience patterns, or [...] the opening of indeterminacy spaces*" (Marotzki and Jörissen, 2008, p. 100[43]). In that sense, there is considerable similarity with the conceptualisations of other scholars, who theorised and contemplated about online (learning) spaces. For example, Gee (2005, p. 223[44]) used the term affinity spaces. He introduced this term as a result of his disagreement with concepts like “community”, which in his opinion focused too much on membership. According to the author this carries the connotation of “*close-knit personal ties among people which do not necessarily always fit [the situation]*” (p. 214[44]). However, his work is largely rooted in observations from and around real-time strategy computer games. Consequently, it can be argued that affinity spaces only have limited relevance for situations where individuals engage into deliberative professional learning. Alternatively, Howard Rheingold (2007[45]) has promoted the term smart mobs. Yet, while there are again conceptual similarities, Rheingold’s work has mainly been used in conjunction with topics like political engagement (Hart and Sharma, 2004[46]) and smart (technical) systems (Lee et al., 2006[47]). Ito and colleagues (2012[48]) refer to connected learning, which is fostered in a (online) space and “*[…] seeks to build communities and collective capacities for learning and opportunity*” (p. 8[48]). Consequently, learning spaces can therefore be described as being embedded in the immediate environments of individuals and enable them to explicate their own ideas and experiences, which in turn

contributes to a growing pool of resources and information that everyone can benefit from (Kolb and Kolb, 2017[49]).

In the context of social media, it has been argued that a possible advantage of such online learning spaces is that they can create "*persistent, predictable, multi-user connections that support a wide range of user interaction and collaborative activity*" (Mynatt, O'Day and Adler, 1998, p. 124[50]). Additionally, some authors have suggested that they constitute a combination of personal learning spaces that are socially connected and provide a collaborative foundation for informal learning (McPherson, Budge and Lemon, 2015[51]). However, when you enter such spaces, neither learning nor knowledge creation are guaranteed. Instead, they provide an opportunity for informal, professional development by enabling individuals to engage into discussions with a wide variety of other individuals (Tynjälä, 2013[52]) and by stimulating them to critically reflect on their actions (Kolb, 1984[53]). We therefore argue that social networking sites constitute social opportunity spaces, which provide the meta-context wherein knowledge creation is fostered and learning processes are stimulated by the complex interplay of various underlying relations and factors (Spanhel, 2010[42]). Akkerman and Bakker (2011, p. 133[54]) have termed this possibility "*boundary crossing*", in order to describe a situation where individuals are enabled to expand their horizon and looking outside of their "*narrow daily existence*" (Williams, 2006, p. 600[55]). Lohman (2005, p. 505[56]) calls this process as "*environmental scanning*".

Yet, while previous research has already touched upon this topic, these studies can be criticised on the basis of three main issues. First, numerous studies have been conducted among students, and while these studies have provided valuable insights on the topic, research in the context of a wider audience and informal learning remains scarce. Second, previous research on SNS has largely dealt with Facebook and has neglected other SNS, such as Twitter. Third, research communities have started to use social networks to investigate patterns of relations among actors in education.

Yet, while networks are gaining interest in recent years, the intersection between educational innovation and social networks has received limited attention. This chapter addresses these shortcomings by investigating whether and how discussions about educational innovation can be traced and mapped on Twitter in a variety of international settings. Specifically, we were interested in possible difference between English-speaking countries (primarily the United States and the United Kingdom) and French-speaking countries (primarily France), as the applicable educational systems show clear differences in terms of organisational structures, financial endowment and characteristics such as the degree of internationalization (OECD, 2018[57]). The approach was then replicated for Spanish-speaking countries. This first of its kind exploration is meant to provide insights into the educational innovation space as well as suggest a provide a proof-of-concept for broader endeavour and investigation drawing on big data from Twitter at the international level.

The objectives was to identify the types of practices related to educational innovation in the social media space, what types of educational innovation stakeholders discuss, how the networks around different types of innovation relate to each other, and whether the mechanisms of introduction and diffusion of educational innovation in the social media space appear similar (or not) across countries.

Data

Twitter (http://www.twitter.com) is a free online global social network that combines elements of blogging, text messaging and broadcasting. Users write short messages limited to 280 characters, known as tweets, which are delivered to everyone who has chosen to receive that user's tweets. This type of communication has greatly contributed to the ease and flexibility with which information can be shared among large groups of people, irrespective of time and place (Ye et al., 2012[58]). Within each tweet, it is possible to include links to other media or to embed video, images and hashtags (a word or a phrase prefixed with the symbol #). Including hashtags in tweets has become common practice on Twitter and allows individuals to

include their contributions in a larger conversation about a certain topic, which enhances their possibility to access networks and further develop their already existing ones (Letierce et al., 2010[59]). Twitter users can interact and communicate in different ways, and users are finding new and creative ways to get the most out of each tweet. First, they can write simple messages, called tweets, adding images, videos, hashtags, etc. Second, tweets can be further disseminated when recipients repost them through their timelines. This technique, called retweeting, refers to the verbatim forwarding of another user's tweet. A third type of messaging is a variant of tweeting and retweeting, called mentioning. Mentions include a reference to another Twitter user's username, also called a handle, denoted by the use of the "@" symbol. Mentions can occur anywhere within a tweet, signalling attention or referring to that particular Twitter user.

To collect data on keywords related to educational innovation, we utilised a customised data collection tool developed by two of our co-authors (Daly and del Fresno), called Social Runner Lab. Social Runner Lab allowed us to download data in real time directly from Twitter's Application Programming Interface (API) based on tweets using specified users, keywords, key phrases, or hashtags. Examples of the parameters include #eduinov, #edtech, #pedagogiesactives, @MPLS_national and @HBP_education. Using Twitter's application programming interface (API), we conducted two data collection runs. First, we collected all tweets and user profile info from 15 June until 15 December 2019 as a pilot test run to determine proof-of-concept in this space. We captured Twitter profile names as well as the tweets, retweets, and mentions posted. Our data include messages that are public on Twitter, but not private messages between individuals, nor from accounts which users have made private or direct messages. Overall, this resulted in 643 332 Tweets. However, this included a wide variety of noisy data. Consequently, we applied filters to really focus on educational innovation and removing users that might skew the overall findings (e.g. Minister of Education in France). This filtering process resulted in a total of 168 534 tweets, of which 157 849 were from an English-speaking context and 10 685 were from a French-speaking context. Second, and using the experience from the initial proof-of-concept, we extended our analyses to also incorporate another globally spoken language, Spanish. This time, we captured data over a three-month period (mid-June 2020 to mid-September 2020). Departing from a search for the keyword education, we again used filter mechanisms to zoom in on innovation, which then resulted in a total of 4 389 tweets.

Social network analysis: methodology

Social network analysis

In order to determine the underlying structure of the Twitter conversations, we used social network analyses (also referred to as SNA). Social network analysis is grounded in the larger idea of social network theory (e.g. (Wasserman and Faust, 1994[60])) and draws on a set of metrics to examine the pattern of connections, or ties, between individuals that create a larger social network. This network forms a social structure of relationships, which can facilitate or inhibit an individual's access to both physical and intellectual resources such as knowledge, ideas, and opinions (Daly et al., 2010[61]; Rehm et al., 2020[31]; Schlager et al., 2009[62]). This structure allows for analyses at the individual, dyad, small group, and overall network level and as such provides insights into patterns of interactions that are not readily visible (Scott, 2017[63]).

For the purpose of this study, we computed three commonly used Social Network Analysis indicators, namely *in-, out-,* and *overall degree centrality* of all users (nodes) taking part in the applicable discussions (Grabowicz et al., 2014[64]). *In-Degree* centrality measures how often a user is contacted by others. In the case of Twitter this translates into a user being mentioned or replied to by another user. *Out-Degree centrality* captures how often a user contributed to the discussion. In other words, how often she mentioned or replied to another user. It is important to note at this stage that Tweets do not provide explicit connections to others. If person A tweets something without mentioning or replying to person B, they do of course contribute to the discussion. However, as such a contribution is not directly targeted at another user, they

do not contribute to the networks relational structure. *Overall degree* centrality combines in- and out-degree centrality and aggregates the two.

These metrics enable us to better understand whether there were actors that were more active in the social network. Having greater centrality in a network suggests an individual actor has disproportionate influence over the exchanges in that network and, as such, that his or her opinion carries more "weight". In this context, we distinguish between three distinct types of actors, namely i) *transmitters*, ii) *transceivers*, and iii) *transcenders* (Fresno García, Daly and Segado Sánchez-Cabezudo, 2016[65]).

- *Transmitters* are individuals who send out a large number of mentions and replies, which translates into a high out-degree. Out-degree is not related to the number of followers a transmitter has but is strictly a measure of how many applicable messages an individual posts.
- *Transceivers* are a different kind of actor. More specifically, they receive a high degree of mentions and replies. This in turn will contribute to an individual's in-degree centrality.
- *Transcenders* are individuals that score high in both in- and out-degree centrality and can also be described as the "elite" of a network.

We were also interested in the inner structure and clustering of the interactions within the larger connected networks. Consequently, we ran a modularity community detection algorithm to identify and represent factions (a "faction" in this sense is a group with more ties within than across groups, although even those group boundaries are somewhat porous) (Newman, 2006[66]; Noack, 2009[67]). Within the identified communities, we then focused on individuals with prominent roles (highly degree centrality) in the network (e.g. Burt (2010[68]) and (Lee et al., 2014[69])). In the context of this study, we follow earlier work and consequently zoomed in on the top 1% of users for this particular type of consideration (Moukarzel, Rehm and Daly, 2020[70]; Moukarzel et al., 2020[71])[2].

The collection of data from social media has sometimes raised questions of ethical concern among the research community. More specifically, some scholars are concerned about the confidentiality of information gathered from human subjects, as well as the public confidence and trust in researchers' work (Koene et al., 2015[72]). While acknowledging the importance of these types of concerns, we are proponents of the work by, among others, Moreno and colleagues (2013[73]), who define a human subject as "*a living individual about whom an investigator obtains data through interaction with the individual or identifiable private information*" (p. 709[73]). Based on this definition, they argue that data from social media, particularly Twitter, qualifies as an exemption from usual guidelines and considerations about informed consent that apply to design research datasets. Participants generally use these types of platforms to publicly disseminate their thoughts, ideas and experiences. Consequently, as in our case, if researchers only collect publicly available data from social media, which requires no password to obtain, concerns about confidentiality and trust can be relaxed.

Hashtags & media

Tweets, Mentions and Replies do not only contain information about users. As indicated before images, videos, and hashtags are other prominent parts of tweets that are commonly used. Twitter data therefore constitutes a so-called "*tripartite graph structure*" (Halpin, Robu and Sheperd, 2007[74]), which is often found in the context of online collaborative platforms. In other words, Twitter contains data on i) users, ii) hashtags (which essentially are a categorising mechanism to assign Tweets to discussions) and iii) media (e.g. online resources, such as videos, blog posts, articles that are shared). We are then considering 2- and 3-mode network analyses in which there are two or all three types of data (Wasserman and Faust, 1994[60]). For the purpose of this work, we decided to focus on hashtags and media separately. In terms of hashtags, we first determined a 2-mode network of users and hashtags (Latapy, Magnien and Del Vecchio, 2008[75]). Here, relationships between individuals are not necessarily established based on direct contact (e.g. mentions or replies), but rather on the basis of discourse (e.g. unknowingly using the

same hashtag). Based on this network, we were then able to construct a one-mode projection, which showed connections between hashtags. Similarly to our users' analyses, we then also ran a community detection algorithm, in order to identify and represent clusters of hashtags that might represent a common topical focus. In terms of the media resources being shared, we aggregated the most commonly shared uniform resources locators (URLs) and considered exemplary cases of what was being shared. For the applicable analyses, we again used the combination of R and gephi to determine and produce the relevant results.

Results

In this section, we present the results of the analysis applied to the English and French discussions around educational innovation in the Twitter space. We present the English- (which proves to be mainly a US-) network structure, then the French-based network, before presenting the extension of the approach to the Spanish case. We then highlight some of the commonalities and differences among those three online spaces.

Analysis of the overall (English- and French-based) network

Before considering the specific cases of the English- and French-based Twitter network structures, Table 7.1 provides an overview of the main Social Network Analysis metrics. As can be seen, there is a high level of variance in the data sample. Additionally, by considering the quartiles, it becomes apparent that the distribution across all levels of degree is highly skewed, indicating that the majority of people were following the applicable hashtags while not pro-actively taking part (out-degree) or being overly included (in-degree) in the discussions. This is further emphasised by, on average, low levels for all three types of degrees. Finally, the high maximum values for the degrees indicated that there are key users that are at the centre of the discussions and really driving the discussions.

Figure 7.1 provides an overall sociogram merging both samples. As can be seen, while the English-based Twitter discussion related to educational innovation is considerably larger, in terms of users (dots) and connections (lines), both discussions show an overlap with each other (Figure 6.1b). This means that irrespective of any region-specific considerations and networks, there is a group of users that are linked across networks and therefore access information and contribute to the discussion of educational innovation. Zooming in on the most active users, based on their overall-degree centrality (Figure 7.2), we again see, as to be expected, more user accounts from the US-based discussion. However, we also discovered a small group of user accounts from the French-based discussion that appear to form their own community, are all interconnected with each other and also linked with central user accounts from the English-based discussion.

Table 7.1. Descriptive social network analysis statistics (Overall network)

	In-Degree centrality	Out-Degree centrality	Overall Degree centrality
Mean	1 584	1 584	3 168
StDev	10 906	16 130	23 046
Quantiles			
1st	0	0	1
2nd	1	1	1
3rd	1	1	2
4th	1 325	1 925	2 718
Min	0	0	0
Max	1 325	1 925	2 718

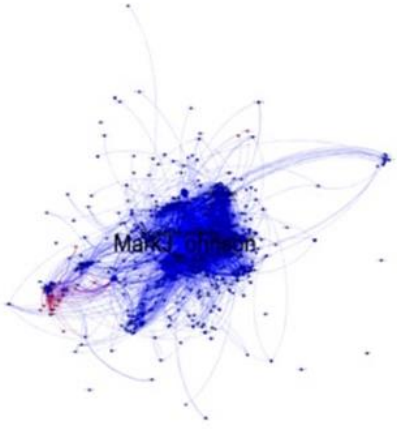
Figure 7.1. Overall network: English- and French-based Twitter discussion



a) Raw Data b) including Source of Discussion

Note: Blue – English-based Twitter; Red: French-based Twitter
Note: Overall network: Users (Nodes): 66 701; Mentions & Replies (Edges): 142 062; Tweets: 168 534

Figure 7.2. Overall network (Top 1% overall-degree)



Note: Users (Nodes): 667; Mentions & Replies (Edges): 4.280; English-based Twitter: 71.73% Users; French-Based Twitter: 28.27% of Users

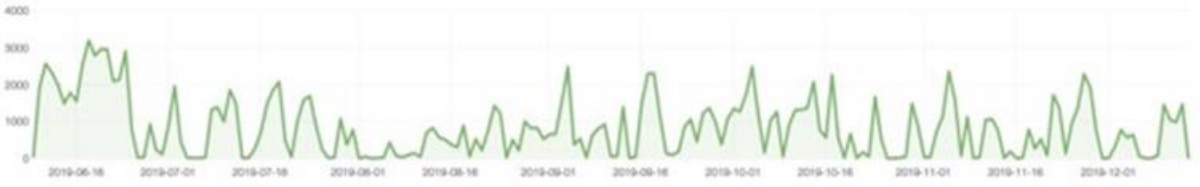
Analysis of English-based (US-) network

This section focuses on the English-based Twitter network, whose analysis shows that it is mainly a US-based network.

Users

The overall distribution of Tweets across the selected time period are visualised in Figure 7.3 below. As can be seen, while there has not been a constant level of interaction, there are a wide selection of peaks where the topic has been actively discussed by the applicable network.

Figure 7.3. Timeline: English



As a next step, we constructed sociograms for the entire network and determined factions using the chosen community clustering algorithm (Figure 7.4). Our findings suggest that there is a wide range of communities (communities are shown in differing colours) that are predominantly connected with each other, which is exemplified by the numerous connections between the communities (Figure 7.4). Moreover, as the algorithm identified all these different communities, we can preliminarily stipulate that these communities, while being connected, have something specific or unique about them. For example, it could be a certain group of people that already know each other offline, or a set of users that are particularly interested in a certain subtopic of educational innovation.

Based on the overall network structure, we determined the *in-, out- and overall centrality metrics*, in order to filter the sociograms and focus on the previously indicated three distinct types of actors, namely i) *transmitters* (Figure 7.5), ii) *transceivers* (Figure 7.6), and iii) *transcenders* (Figure 7.7).

Our results suggest that five Twitter accounts, from five different communities, have been particularly active in transmitting information (Figure 7.5). More specifically, @ScalarHumanity, @ericcurts, @MarkJ_ohnson, @mtholfsen, and @MynaEdu exhibit high out-degrees. On closer inspection, these accounts can be classified into personal accounts (@ericcurts, @MarkJ_ohnson, @mtholfsen) and organisational accounts (@ScalarHumanity, @MynaEdu). Moreover, when considering the indicated geographical regions of these accounts, all personal accounts appear to be based in the United States, while one organisational account indicates to be located in Australia (@MynaEdu).

When considering Transceivers (Figure 7.6) a similar picture emerges, with five accounts, from five communities, exhibiting significant, in this case, in-degree centrality. Here, @MarkJ_ohnson, @Alex_Corbitt, @MynaEdu, @ICTEvangelist, and @MindShiftKQED are noticeable. Interestingly, @MarkJ_ohnson and @MynaEdu appear again in this list. A closer look at the previously not mentioned accounts revealed again two personal accounts (@Alex_Corbitt and @ICTEvangelist) and one organisational account (@MindShiftKQED) that are US- (@Alex_Corbitt and @MindShiftKQED) and UK-based (@ICTEvangelist). Combining the two previous roles exhibiting high degrees, resulted in the Transcenders depicted in Figure 7.7. The applicable results suggest that the previously indicated users are really taking on an active role in the discussion about educational innovation (e.g. high out-degree) and are, as such, apparently also perceived as notable accounts by the community (e.g. high in-degree).

Figure 7.4. Overall network: English

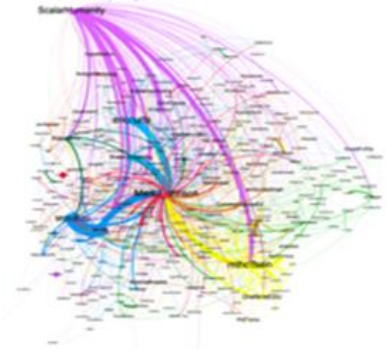


a) Raw Data

b) including Community-Structure

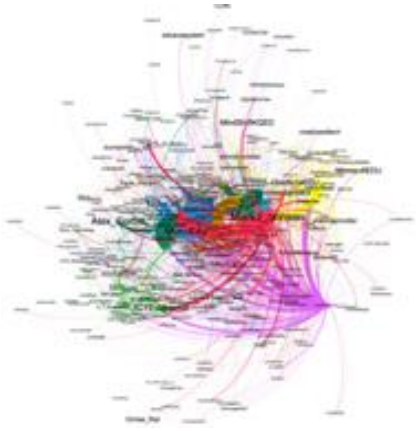
Note: Users (Nodes): 37 040; Mentions & Replies (Edges): 55 060

Figure 7.5. Out-degree network (Top 1 %): English (Transmitters)



Note: Users (Nodes): 364; Mentions & Replies (Edges): 1 842

Figure 7.6. In-degree network (Top 1 %): English (Transceivers)



Note: Users (Nodes): 381; Mentions & Replies (Edges): 1 917

Figure 7.7 "Elite Network" high in- and out-degree (Top 1%): English (Transcenders)



Note: Users (Nodes): 36; Mentions & Replies (Edges): 135

Table 7.2 summarises the applicable descriptive statistics that are depicted in Figures 7.5 to 7.7. Here, in addition to the already mentioned findings, a similar picture emerges as for the overall network. While the mean values are significantly higher than before, across all types of users, a noticeable degree of variance within the subsets remains. This is particularly pronounced in case of the Transcenders. Moreover, albeit less strongly pronounced, the data continues to be highly skewed. Again, this is mainly driven by a number of key users that putting considerable upward pressure on the means. This suggests that, while the consideration of Transmitters and Transceivers and Transcenders is a valuable tool to get a better picture of the underlying communication flows, the real core of the discussion is comprised of a still smaller group than the currently defined top one percent.

Table 7.2. Descriptive social network analysis statistics (English)

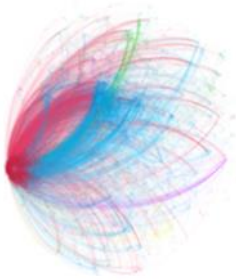
	Transmitters		*Transceivers*		*Transcenders*		
	Out-Degree		In-Degree		In-Degree	Out-Degree	Overall Degree
Mean	55.06		46.66		181.58	309.67	491.25
StDev	173.14		93.12		244.22	488.02	611.39
Quantiles							
1st	17		18		48.25	83	196
2nd	22		24		111.5	129.5	224
3rd	38.75		39		189.25	208	436.75
4th	1 925		1 325		1 325	1 925	2 718
Min	13		15		22	41	137
Max	1 925		1 325		1 325	1 925	2 718

Hashtags

After mapping the network structure for the user accounts, we shifted our attention to the content of what was being tweeted. Figure 7.8 below represents the one-mode projection for the identified hashtags in the Tweets. Based on the chosen community detection algorithm, we are able to show "content communities" that seem to be interested in particular (combination of) sub-topics of educational innovation (as shown by the different coloured accounts nodes). When taking a closer look at the three largest "content communities" (Figure 7.9), we found that they cover three particular aspects that are related to educational innovation. The first, and largest community, deals with topics around science, technology, engineering and mathematics (STEM) (Figure 7.9a). The second community appears to have a focus on educational technology and how concepts like artificial intelligence, augmented-reality and virtual-reality can be used

in education (Figure 7.9b). Finally, the third community covers topics around cybersecurity and ICT (infrastructure) (Figure 7.9c).

Figure 7.8. Overall hashtag network: English (including community-structure)



Note: Hashtags (Nodes): 11.202; Connections (Edges): 47.091

Figure 7.9. Hashtag networks: English (Top communities)



a) "STEM" | b) "Technology" | c) "Cybersecurity"

Note: „STEM": Hashtags (Nodes): 6 819, Connections (Edges): 25 486; „Technology": Hashtags (Nodes): 3 355, Connections (Edges): 9 301; „Cybersecurity": Hashtags (Nodes): 255, Connections (Edges): 511.

Table 7.3 shows the most commonly used hashtags and allows to unpack the hashtag communities a bit more. Educational technology (#edtech, #EdTech and #Edtech) has a strong presence and makes up 8.79% of all hashtags. This is remarkable, as it is about triple the amount of activity the second largest hashtag has been included, namely education (#education and #Education) is engaged.

Table 7.3. Most commonly used hashtags (English)

Rank	Hashtag	Degree		Rank	Hashtag	Degree
1	edtech	5 917		11	AI	424
2	education	2 099		12	teachers	419
3	EdTech	1 876		13	ISTE19	386
4	edchat	1 125		14	innovation	381
5	Education	773		15	edtechchat	377
6	Edtech	632		16	tech	341
7	learning	527		17	k12	327
8	STEM	458		18	teaching	312

Rank	Hashtag	Degree		Rank	Hashtag	Degree
9	elearning	426		19	highered	291
10	technology	425		20	students	290

Media/URLs

The preliminary analysis of the hashtags already suggested some more specific topics that were prevalent in the context of the English-based Twitter discussion. Table 7.4 presents the most frequently shared URLs per defined type of user and indicates a considerable amount of overlap between the three categories. Based on how the three types of users are defined, this was to some extend to be expected, as particularly the *Transcenders* will, by definition, include a range of users from the other two categories. Moreover, on closer inspection, some nuanced differences can be observed. While *Transmitters* are the only ones sharing resources from "educatorstechnology.com" (a platform for educational web tools and apps for teachers), *Transceivers'* unique top URL is from " andrewscampbell.com" (the blog of a Canadian educator and writer), and *Transcenders* are unique in sharing the URL "freetech4teachers.com" (the website of a US high school computer science teacher).

Table 7.4. Most frequently shared URLs per type of user (English)

	Transmitters			*Transceivers*			*Transcenders*	
Rank	Domain	N		Domain	N		Domain	n
1	controlaltachieve.com	211		controlaltachieve.com	210		controlaltachieve.com	211
2	paper.li	85		paper.li	86		paper.li	86
3	eraser	49		rdene915.com	45		eraser	49
4	rdene915.com	45		medium.com	36		rdene915.com	45
5	medium.com	36		edsurge.com	29		medium.com	37
6	edsurge.com	27		docs.google.com	14		edsurge.com	31
7	educatorstechnology.com	24		amazon.com	14		educatorstechnology.com	24
8	amazon.com	15		anchor.fm	13		amazon.com	14
9	anchor.fm	13		youtube.com	8		anchor.fm	13
10	docs.google.com	12		andrewscampbell.com	6		freetech4teachers.com	13

In order to shed some more light on this issue, we also looked at a sample of URLs and media that were shared within the Tweets. Some exemplary screenshots are provided in Figure 7.8. As can be seen, the shared resources deal with coding (Figure 7.10a), virtual reality (Figure 7.10b), educational transformation (Figure 7.10c) and recommendations on how to use e.g. Twitter in (high school) education (Figure 7.10d).

Figure 7.10. Screenshots of most commonly shared media/URLs: English



a)



b)



c)



d)

Source: Fontana Unified School District (a); https://markmetry.medium.com/the-best-15-free-virtual-reality-apps-for-education-29b4e68a2917 (b); Forbes (c); Todd Finley (@finleyt) (d).

Summary

Our analysis of discussions on educational innovation in the English-speaking Twitter space shows that, in 2019, those exchanges were mainly driven by a small community located in the United States, that its intensity fluctuated over time, with periodic peaks, rather than being a constant stream of discussion. The analysis of the content of those discussions allowed to identify three main "communities": the largest one discussed topics around science, technology, engineering and mathematics (STEM), then education technology, and finally cybersecurity.

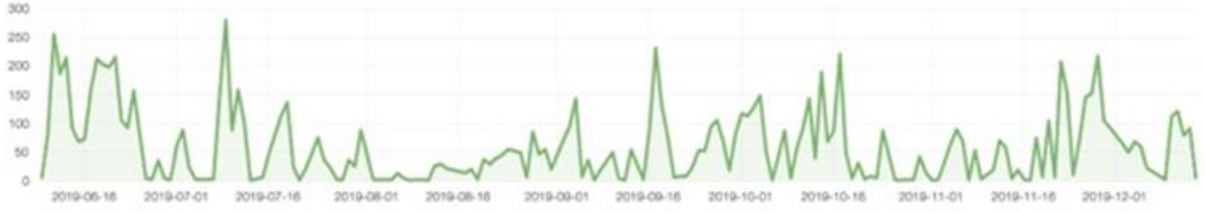
Analysis of French-based network

This section focuses on the French-based Twitter network.

Users

Similarly to the case of the English-based Twitter discussion on educational innovation, in the French case there also is not a constant level of interaction (Figure 7.11). Instead, the observed interaction is subject to regularly occurring communication peaks.

Figure 7.11. Timeline: French



Another similarity between the English and French-based Twitter discussions becomes apparent when considering the sociograms presented in Figure 12 below. Again, we discovered a wide range of communities that are predominantly connected with each other. Departing from these overall network findings, we then also considered i) *transmitters* (Figure 7.13), ii) *transceivers* (Figure 7.14), and iii) *transcenders* (Figure 7.15). Again, focusing on the five Twitter accounts that have been particularly active in transmitting information (Figure 7.13), revealed two types of accounts. However, in contrast to the English-based discussion, there was only one organisational account (@EdtechFrance), while the remaining four accounts (@mdrechsler, @AxelJean77, @DuchanoisG, @FrancoisTaddei) were personal accounts. Moreover, the profile descriptions suggest that, while all accounts appear to be located in

France, there tends to be a geographical focus on the country's capital city Paris. When considering Transceivers (Figure 7.14), we again find five accounts from five communities that exhibiting significant, in this case, in-degrees. While the communities stay the same, the representatives of these community somewhat change. More specifically, @EdtechFrance, @mdrechsler, @FrancoisTaddei continue to be notable users accounts (from the red, yellow and blue community in Figure 7.14, respectively). However, in the green community @lab110bis (an innovation lab) has taken the top position and @diversifier (an author in educational innovation) in the purple community. Considering the role of *Transcenders* (Figure 7.15), we found similar results as in the US-based discussion, with previously indicated users again taking on active roles and being perceived accordingly by the community.

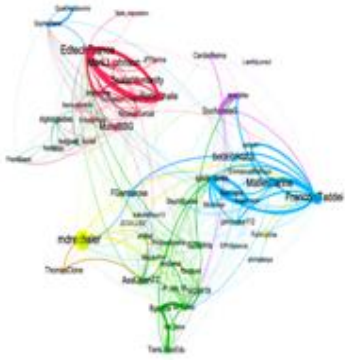
Figure 7.12. Overall network: French



a) Raw Data *b) including Community-Structure*

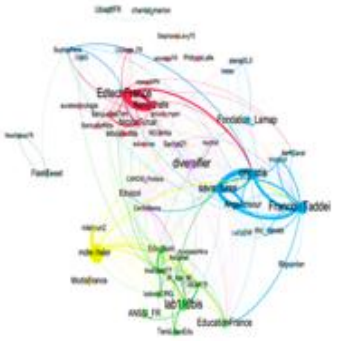
Note: Users (Nodes): 5.290; Mentions & Replies (Edges): 13.941

Figure 7.13. Out-degree network (Top 1%): French (Transmitters)



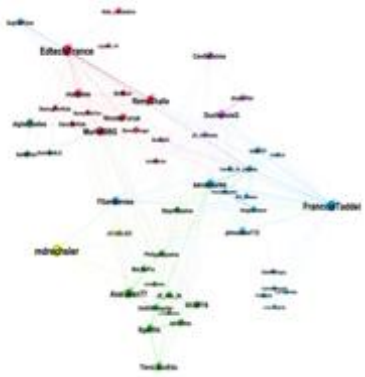
Note: Users (Nodes): 54; Mentions & Replies (Edges): 333

Figure 7.14. In-degree network (Top 1%): French (Transceivers)



Note: Users (Nodes): 53; Mentions & Replies (Edges): 247

Figure 7.15. "Elite Network" – high in- and out-degree (Top 1%): French (Transcenders)



Note: Users (Nodes): 100; Mentions & Replies (Edges): 420

Table 7.5 presents the descriptive statistics for the three types of users. As before, while the overall level of communication is somewhat lower in the French-based data sample, we again see a very similar story as in the English-based data. Again, there remains to be a noticeable degree of variance within the subsets and a highly skewed distribution of all levels of degree. Interestingly, there seems to be a difference in the composition of the overall degree when comparing this data with the English-based version. More specifically, while within the French-based network, the role of the *Transceivers* is more pronounced (as indicated by a higher mean in-degree), the English-based data suggests that the *Transmitters* are more active (as underlined by a higher mean out-degree; see Table 7.3). Hence despite the similarities there also appears to be a noticeable difference in the structure of the underlying networks.

Table 7.5. Descriptive social network analysis statistics (French)

	Transmitters		*Transceivers*		*Transcenders*		
	Out-Degree		In-Degree		In-Degree	Out-Degree	Overall Degree
Mean	22.89		68.63		43.63	18.79	62.42
StDev	16.64		101.37		99.68	17.08	102.90
Quantiles							
1st	15		29.5		11	11	25.75
2nd	17		40		19.5	14	33
3rd	25		64		36.25	22	60.25

	Transmitters		*Transceivers*		*Transcenders*		
4th	152		904		904	152	930
Min	13		24		5	9	18
Max	152		904		904	152	930

Hashtags

Figure 7.16 visualises the one-mode projection of identified hashtags within the Tweets. The most commonly used hashtags are summarised in Table 6. In contrast to the English-based sample, here we found a larger number of "content communities", covering i) "EdTech" (Figure 7.17a), ii) "Education" (Figure 7.17b), iii) "Innovative (School) Projects" (Figure 7.17d), iv) "massive open online courses (MOOCs)" (Figure 7.17e), iv) "Inclusion" (Figure 7.17f) and v) a "Canadian (Weekly) Chat" (Figure 7.17c). The latter is particularly interesting as it extends the otherwise supposedly European discussion into North America.

Figure 7.16. Overall hashtag network: French (including community-structure)

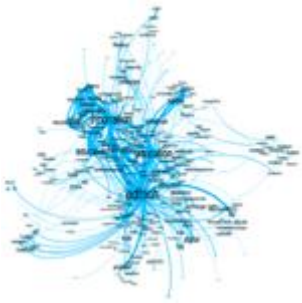


Note: Hashtags (Nodes): 1.122, Connections (Edges): 2.160

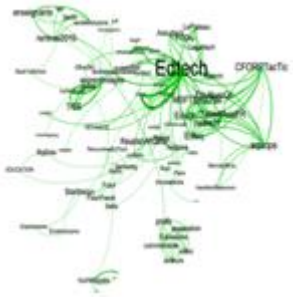
Figure 7.17. Hashtag networks: French (for Top 6 communities)



a) "EdTech"



b) "Education"



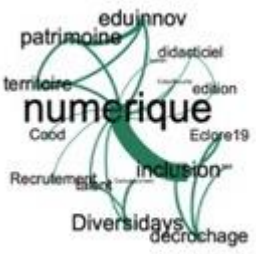
c) "Canadian (Weekly) Chat"



d) "Innovative (School) Projects"



e) "MOOCs"



f) "Inclusion"

Note: „EdTech ": Hashtags (Nodes): 283, Connections (Edges): 597; „Education": Hashtags (Nodes): 271, Connections (Edges): 572; „Canadian (Weekly) Chat": Hashtags (Nodes): 84, Connections (Edges):171; „ Innovative (School) Projects": Hashtags (Nodes): 44, Connections (Edges): 55; „ MOOCs ": Hashtags (Nodes): 55, Connections (Edges): 87; „Inclusion": Hashtags (Nodes): 34, Connections (Edges): 44.

Table 7.6 provides an overview of the most commonly used hashtags from the French-based data sample. Again, as compared to the English-based sample, educational technology is the most commonly used and dominant hashtag. Interestingly, innovation and educational innovation rank higher as compared to the English-based case, suggesting a more prevalent explicit use of the innovation notion in the French-speaking educational sphere. Discussions around education technology (#edtech, #EdTech and #Edtech), the digital transformation (#numerique, #TransfoNum, #digital) and AI (#IA, #AI) show the strong association of innovation to education technology. Furthermore, hashtags like #formation, #education and #apprendre suggest a higher level of consideration for how to implement (educational) innovation in practice. The IDEFI refers to the excellence initiative in innovating training, a large competition funded by the French government.

Table 7.6. Most commonly used hashtags (French)

Rank	Hashtag	Degree		Rank	Hashtag	Degree
1	edtech	194		11	Formation	31
2	EdTech	189		12	IDEFI	27
3	Education	86		13	Eduinov	26
4	innovation	79		14	TransfoNum	25
5	Edtech	72		15	digital	21
6	education	67		16	apprentissage	20
7	eduinov	55		17	Startup	19
8	Innovation	49		18	AI	18
9	numerique	48		19	IntelligenceArtificielle	16
10	IA	37		20	Apprendre	16

Note: English translations of the hashtags: numérique: digital; Formation: Training; IDEFI: Innovation competition in France; TransfoNum: Digital transformation: Intelligence Artificial: AI; apprendre: to learn.

Media/URLs

Finally, we again considered a sample of URLs and media that were shared within the French-based Twitter discussion. Table 7.7 shows the most frequently shared URLs among the three defined types of users. Similarly to the English-based sample, we again identified a considerable amount of overlap between the three categories. Even more so, *Transceivers* and *Transcenders* even have the same frequency of shares among the top 10 URLs. This is likely to be related to the fact that, again the two types of groups will inherently have an overlap, and because the amount of active users is comparatively small compared to the English-based sample. Consequently, the same information is more likely to make the

rounds. Interestingly, the URLs being shared represent a mix of English and French resources. Moreover, in the latter case, the resources are both seemingly from France and Canada, which underlines the findings from the applicable hashtag analyses.

Table 7.7. Most frequently shared URLs per type of user

	Transmitters			*Transceivers*			*Transcenders*	
Rank	Domain	N		Domain	N		Domain	N
1	paper.li	34		rire.ctreq.qc.ca	10		rire.ctreq.qc.ca	10
2	ici.radio-canada.ca	9		edutopia.org	10		edutopia.org	10
3	les-savanturiers.cri-paris.org	9		les-savanturiers.cri-paris.org	9		les-savanturiers.cri-paris.org	9
4	edtechfrance.fr	4		ecolebranchee.com	8		ecolebranchee.com	8
5	podcasts.apple.com	4		carrefour-education.qc.ca	5		carrefour-education.qc.ca	5
6	lapresse.ca	4		ludomag.com	5		ludomag.com	5
7	ecolebranchee.com	3		weareteachers.com	5		weareteachers.com	5
8	business.lesechos.fr	2		edcan.ca	4		edcan.ca	4
9	outilstice.com	2		kqed.org	4		kqed.org	4
10	cpformation.com	2		youtube.com	4		youtube.com	4

Figure 7.18 provides some exemplary screenshots. Interestingly, the topics differ noticeably from the English-based discussion. More specifically, in this particular context we found shared resources that deal with a call for applications for the national day of educational innovation, an event organised by the French ministry of education that typically highlights educational innovation by awarding innovation prizes (Figure 7.18a), a critical reflection about educational innovation, in general, and educational technology, in particular (Figure 7.18b), practical considerations from instructional design theories (Figure 7.18c) and platforms to exchange best educational practices, supported by the French ministry of higher education (Figure 7.18d). Indeed, more resources relate to governmental initiatives compared to the US examples.

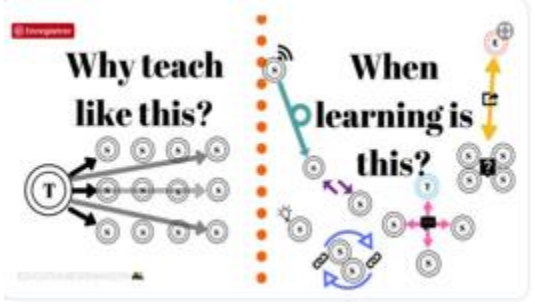
Figure 7.18. Screenshots of most commonly shared media/URLs: French



a)



b)



c)



d)

Source: French Ministry of Education (Ministère de l'Éducation nationale) (a); La Tribune (b) ; Education Rickshaw, https://educationrickshaw.com/2017/12/02/after-100-years-of-the-same-teaching-model-its-time-to-throw-out-the-playbook/ (c) ; French Ministry of Higher Education and Science (Ministère de l'enseignement supérieur, de la recherche et de l'innovation) (d).

Summary

Our analysis of discussions on educational innovation in the French-speaking Twitter space shows that, in 2019, those exchanges were much less frequent than in the English space, mainly driven by occasional exchanges in France and Canada, but with more clearly identifiable "content" communities. While digital technology and transformation are key aspects of discussions on innovation, more non-technological exchanges also occurs, for example around innovative school projects or governmental competitions on pedagogical innovation.

Extension of the original analyses to Spanish-based network

In order to explore another Twitter space but also to test the replicability of our initial analyses to other languages, in 2020 we replicated a similar approach using Spanish terms.

Users

In the Spanish-based sample, using the broad search term "education", resulted in 1 269 million unique tweets from 592 421 unique authors. A subsequent filtering limiting the query to (innovation OR innovation) AND (education OR education)[3] produced a data sample of 4 389 unique Tweets and 2 663 unique authors. The applicable distribution of Tweets across time is shown in Figure 7.19, below[4]. In comparison to the analysis we did in the English and French based samples, we again found considerable fluctuations in communication. Moreover, the discussion about educational innovation specifically, was less pronounced than the overall discussion about education.

Figure 7.19. Timeline: Spanish



Table 7.8. Descriptive social network analysis metrics (Spanish)

	In-Degree	Out-Degree	Overall Degree
Mean	1,075	1,075	2,151
StDev	7,503	2,088	7,990
Quantiles			
1st	0	0	1
2nd	0	1	1

	In-Degree	Out-Degree	Overall Degree
3rd	1	1	2
4th	376	59	386
Min	0	0	0
Max	376	59	386

Another similarity between the English- and French-based Twitter discussions is exemplified by the results provided in Table 7.8 and Figure 7.20. Table 7.8 summarizes the main network metrics. Similarly to the English and French cases, the discussion in the Spanish case was subject to noticeable variance in frequency and highly skewed. The latter is underlined by the results on the quartiles and again suggests that only a small percentage of users was heavily invested in pro-actively joining and contributing to the discussions. The sociograms in Figure 7.20 visualise again the existence of a wide range of communities. Yet, in the Spanish case these communities are predominantly not connected with each other. The most probable cause for this observation of lower structural cohesion is related to the fact that the Spanish language is an extensive community of 21 countries with very different types of social structures, educational systems and different rates of Internet access. This is also true for English and French, but in these cases the findings ended up clearly zeroing in on the higher income countries speaking the languages.

Figure 7.20. Overall network: Spanish



a) Raw Data *b) including Community-Structure*

Note: Users (Nodes): 8 637; Mentions & Replies (Edges): 11 566.

Departing from these overall network findings, we then also considered again i) *transmitters* (Figure 7.21), ii) *transceivers* (Figure 7.22), and iii) *transcenders* (Figure 7.23).

In the top 1% of the transmitters network (Figure 7.21), although there are a greater number of prominent individual nodes than in other languages, there are also fewer relationships between them. The possible explanation for the multiplicity of countries also seems to be the most reasonable explanation in this case. Among the most prominent profiles of this network were @Claudiashein (Head of Government of Mexico City 2018-2024), @nefeerr (Spanish, human rights activist), @somosroliev (a network of Latin American organisations interested in innovating in education), @enlight_ED (an international network of Education, Innovation and EdTech promoted by @FundacionTef, @IEuniversity, @fundsantillana and @south_summit), @asociacionminu (an Argentine association for the development of projects developed by young people, for young people and projects educational programs that promote participation and inclusion), @MovimientoSTEAM (initiative in Mexico to promote innovation and the development of skills to compete in the 21st century world of work), and @Reynaldo_VZ (Cuban university academic leader). Again, these short descriptions of the applicable users accounts clearly highlight the equal dispersion of

the discussions across several countries (or networks) of the Spanish language. As in the French-based sample, we see first indications that the overall data can be subdivided into the subsets that appear to be driven by geographical regions (e.g. Spain, Mexico, Chile and other South American countries).

Figure 7.21. Out-degree network (Top 1%): Spanish (Transmitters)

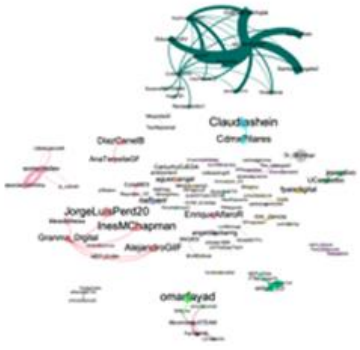


Note: Users (Nodes): 109; Mentions & Replies (Edges): 96

Considering the top 1% of Transceivers network (Figure 7.22), we again discovered different regional cliques. Furthermore, users like @Claudiashein (Head of Government of Mexico City 2018-2024) were again central to the discussion. Additionally, @omarfayad (Constitutional governor of the Mexican state of Hidalgo), @JorgeLuisPerd20 (Minister of Communications of the Republic of Cuba), @InesMChapman (Vice Prime Minister of the Republic of Cuba), @nefeerr (Spanish, human rights activist), and @fpaisdigital (Chilean foundation for development and the dissemination of a digital culture to improve people's quality of life) were among the other central users from the discussion. Interestingly, in comparison to the English and France cases a closer inspection confirms our earlier finding that the individual communities were less frequently connected. Even more so, the central users are also less likely to connect with each other, as compared to the English- and French-based samples.

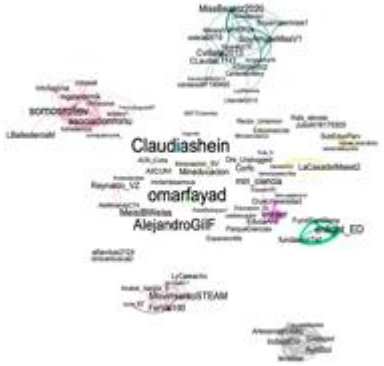
Finally, Figure 7.22 provides a sociogram that zooms in on the *Transcenders* network. As to be expected, we found very similar accounts as in the previous two types of networks. In addition, the notion of the geographic fragmentation was again supported. This suggests that issues related to education and innovation are under the control and influence of small cliques and likely country-determined, which results in a less interconnected network, and seems to reflect interactions deeply rooted in the local education systems and its challenges in the context of educational innovation.

Figure 7.22. In-degree network (Top 1%): Spanish (Transceivers)



Note: Users (Nodes): 94; Mentions & Replies (Edges): 94

Figure 7.23. "Elite Network" – high in- and out-degree (Top 1%): Spanish (Transcenders)



Note: Users (Nodes): 83; Mentions & Replies (Edges): 177.

Table 7.9 provides the underlying descriptive Social Network Analysis metrics for Figures 7.21 to 7.23. As in the English and French cases, the mean values are significantly higher than for the overall network, we continued to observe a considerable degree of variance, and the data remained heavily skewed. Interestingly, the variance within the group of *Transcenders* for the out-degree was comparatively low, which suggests a commonality among the applicable users in terms of communicative behaviour. This is even more interesting as we already discovered that these users were separated within the overall discussion based on country location and seemingly content-related terms.

Table 7.9. Descriptive social network analysis statistics – Types of user (Spanish case)

	Transmitters		*Transceivers*		*Transcenders*		
	Out-Degree		In-Degree		In-Degree	Out-Degree	Overall Degree
Mean	14,97		41,21		13,06	12,26	25,32
StDev	10,15		62,70		43,13	8,08	44,01
Quantiles							
1st	10		14		2	8	12
2nd	11		18		4	10	16
3rd	14		33,75		10	13	25
4th	59		376		376	59	386
Min	8		12		1	7	8
Max	59		376		376	59	386

Hashtags

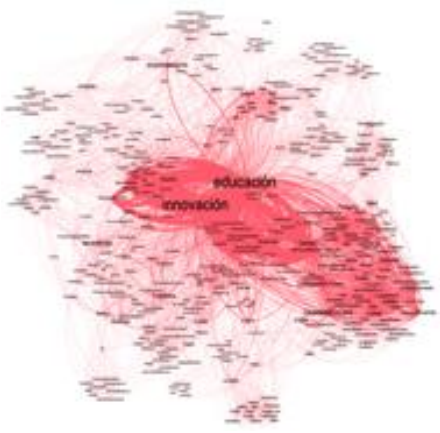
Figure 7.24 visualises the one-mode projection of identified hashtags within the Tweets. The most commonly used hashtags are summarised in Figure 7.25. Here, in contrast to the French case but similar to the English one, we found a limited number of "content communities", covering and dominating the central topics of *innovation* and *education*, followed with a mixed network of hashtags in which both English and Spanish hashtags were used. The third and fourth big communities are related with education technology companies and the digital transformation in education, but also with business management, leadership and entrepreneurship.

Figure 7.24. Overall hashtag network: Spanish (including community-structure)



Note: Hashtags (Nodes): 2 282, Connections (Edges): 20 834.

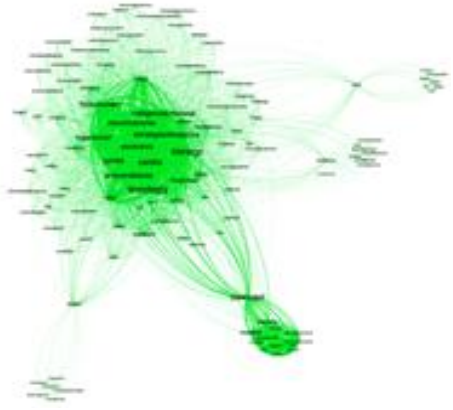
Figure 7.25. Hashtag networks: Spanish (for Top 4 communities)



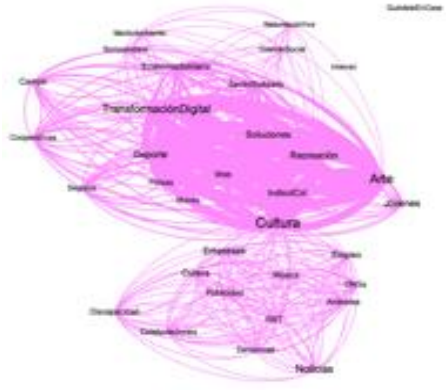
a) "Innovación +Educación"



b) Hashtags ENG



c) Tecnología y Empresas



d) Cultura y transformación digital

Note: „Innovación + Educación" (innovation and education): Hashtags (Nodes): 401, Connections (Edges): 5 708; „Hashtag ENG": Hashtags (Nodes): 144, Connections (Edges): 2 333; „Tecnología y Empresas" (technology and companies): Hashtags (Nodes): 116, Connections (Edges):2 309; „ Cultura y transformación digital" (digital culture and Transformation): Hashtags (Nodes): 44, Connections (Edges):490.

Table 7.10 shows the most commonly used hashtags in the Spanish case, allowed to attain a more nuanced view of the larger community structures. As can be seen, innovation and education are among the most commonly used hashtags, which was to be expected given our search terms – but was not the case in the English case. We also discovered similarities with the English- and French-based samples, as different aspects of technology were also commonly discussed. Interestingly, and this constitutes a noticeable difference to the English and French cases, there was a stronger focus on topics such as change (e.g. #cambio), leadership (e.g. #liderazgo) and experiences (e.g. #experiencias). A clear subset of the discussions related not only to innovation in education but also to educating for innovation, that is, how to prepare students for entrepreneurship and business management.

Table 7.10. Hashtag networks: Spanish (for Top 3 communities)

Rank	Hashtag	Degree	Rank	Hashtag	Degree
1	innovación	2552	16	comunicación	170
2	educación	2544	17	InteligenciaEmpresarial	168
3	tecnología	346	18	estrategiasdenegocios	166
4	Liderazgo	262	19	COVID19	154
5	innovation	256	20	formación	154
6	Tecnología	254	21	TIC	146
7	education	228	22	Experiencias	146
8	cambio	226	23	Aprendizaje	142
9	Elearning	224	24	emprendimiento	142
10	QuedataEnCa	206	25	Escuela	138
11	creatividad	200	26	RedesSociales	138
12	pymes	192	27	EDreform	136
13	emprendedores	184	28	Universidad	132
14	edtech	178	29	Colombia	128
15	escenarios	174	30	tech	124

Note: Liderazgo: leadership; Cambio: change; Creatividad: creativity; Pymes; SMEs; Emprendedores: entrepreneurs; Escenarios: scenarios; Inteligencia empresarial: business intelligence; estrategios de negocios; commercial strategy; formación: training; Experiencias: experiences; Aprendizaje: learning; Emprendimiento: Entrepreneurship; Escuela: school; Redes sociales: social networks; Universidad: university.

Most Commonly Used Media/URLs

Finally, we again considered a sample of URLs and media that were shared within the Spanish-based Twitter discussion. Figure 7.26 provides some exemplary screenshots. Interestingly, the topics confirm the role of political individual and institutions (e.g. Cuba, Mexico, and Chile).

Figure 7.26. Screenshots of most commonly shared media/URLs: Spanish



a) Periódico y órgano oficial del CCPCC



b) Jefa de Gobierno de la Ciudad de México



c) Secretaría de Economía de México



d) Fundación País Digital Chile

Note: a) Newsletter and official outlet of the Central Committee of the Communist Party of Cuba; b) Head of Mexico City government; c) Secretary of the economy of Mexico; d) Foundation País Digital (about developing a culture of digitalisation in Chile.

Summary

The Spanish-speaking Twitter space showed fewer exchanges than the English and French spaces, again mainly occasional, spread across a wide geographic area in Spain, Mexico and South America, probably explaining the lower interconnectedness of the different discussions. While educational innovation appear as an explicit content, digital technology and transformation are also key aspects of discussions, which also emphasise business management and entrepreneurship.

Comparative analysis

This section highlights some of the possibilities of our study for international comparisons, highlighting some of the differences and the similarities across the three linguistic Twitter discussions around educational innovation.

Differences

The analysis allowed us to discover some differences between the three samples.

First, in the context of the French and Spanish-based discussion, personal accounts appeared to play a more central role than organisational accounts. This is very interesting as it suggests a different culture of Twitter usage – e.g. (Park, Baek and Cha, 2014[76]). In the French-based sample, the personal accounts that were central to the discussion appeared to be geographically confined to the greater area of Paris. This closeness to the French (political) capital is again very interesting, as well as the relatively frequent relation of the top exchanged content with the ministry of education. The importance of political actors was even more pronounced in the Spanish case. (In the French case, we removed some of those actors though as they were confounders exchanging on topics that had little relevance for educational innovation.) Even more so, in this particular data sample, the impact of geographical regions was even more pronounced than in the French case, with political users largely disconnected from each other, seemingly on the basis of geographical regions. While Twitter allows users to participate irrespective of time and place (Rehm and Notten, 2016[32]), the access to offline, localised networks also seems to play a viable role in the attainment of centrality in the online network (Antheunis, Valkenburg and Peter, 2012[77]; Mesch and Talmud, 2006[78]). This also suggests the importance of geographic differences and the role of local contexts. The English (or US) case gave more prominence to organisational accounts from companies and foundations. There are thus different patterns in terms of who influences exchanges related to educational innovation in these different contexts.

Second, we observed differences in the level of interconnectivity (or openness) of the different networks. Openness matters for innovation policy, which tries to shape the conditions for knowledge, ideas, and good practices to flow within and across sectors. While all discussions were comprised of a wide range of communities, the Spanish sample showed very few signs of these communities being connected with each other. This suggests a strong internal focus on topics and circumstances that are relevant for the individual communities. In contrast, the English- and French-based samples show a strong degree of interconnectivity between the communities. The latter suggests that while there appear to be (nuanced) differences in the composition and topical foci of the individual communities, there is a general openness for other viewpoints, experiences and insights. Hence, these type of Twitter analyses provide valuable insights into the underlying architecture of discussions and how information spreads throughout the applicable networks. Moreover, policy makers can greatly benefit from this type of information, as it enables them to better understand whether and how different communities (e.g. possibly representing different perspective and points of view) are communicating with each other in an open social opportunity space.

Third, based on the hashtag analyses, it seemed that the English-based discussion focused on a few broader topics, while the French and Spanish-based discussions were more nuanced. We therefore stipulate that the use of the correct terminology is of vital importance when addressing the different spaces. While users from the English-based discussion seem to have agreed on a broad, "catch-all" terminology, the French and Spanish-based discussions had decidedly chosen for a more differentiated approach to discuss educational innovation. Furthermore, within the Spanish sample, we found indications that the discussions particularly served the purpose of sharing information and resources on educational leadership and (practical) experiences. Particularly, if policy makers are searching for information or even would like to share relevant information, this finding needs to be carefully considered, in order to ensure the highest possible uptake by the communities (Archibald and Clark, 2014[79]; McNeill, Harris and Briggs, 2016[80]). The variety of topics of discussion also confirms that educational innovation may concern different aspects across countries (Vincent-Lancrin et al., 2019[2]).

Fourth, the French and Spanish-based discussion showed more signs of organised exchanges of best-practices (e.g. a "content community" on this topic). Again, similar to the previous conclusion, this constitutes a valuable insight for policy makers, as they can better target the type and format of information that they would like to share, or simply get a better understanding of what type of educational innovation is currently discussed and implemented by practitioners. Indications of differences in discussions, e.g. inclusion, instructional design and a critical reflection of educational technology in schools, which were mainly present in the French-based discussion, seem to exemplify general differences in views on educational science depending on the country and educational system (De Corte, 1980[81]). A social media analysis can contribute very valuable insights and considerations to the discussion of different cultures regarding educational science, and, more generally, the approach to educational innovation.

Similarities

We were also able to identify some similarities between the English, French and Spanish cases.

First, the discussions related to educational innovation did not exhibit a constant level of interaction, but rather regularly occurred through peaks in communication. This is particularly interesting for policy makers and other actors in the space of educational innovation, as the timing of Tweets and the knowledge about fluctuations in the distribution of Tweets has been linked to the effectiveness of information campaigns (Dabeer, Karnink and Saroop, 2011[82]), the popularity and virality of content – e.g. (Pancer and Poole, 2016[83]), as well as the diffusion of information (Babcock, Villa Cox and Kumar, 2019[84]). In that sense, conducting social media analyses offers a type of "trend meter" that captures the current mood of the public about various aspects of educational innovation and indicates how they are perceived, as well as how persistent they continue to be of interest. Moreover, better understanding the "cadence" of communication

patterns and how they are similar and different in a variety of contexts may suggest more opportune times to leverage networks.

Second, we found a limited number of communities that were driving the overall discussion in each of the linguistic contexts. This is a commonly observed phenomenon in social networks (e.g. Cross (2006[85]) and (2008[86])). Moreover, knowing about these communities and their (central) members can be valuable information for policy makers to specifically target these communities in an effort to enhance the reach of information (Bernhard and Dohle, 2018[87]; Cinelli et al., 2020[88]; Wekerle et al., 2018[89]). Being able to identify the communities, content, and most importantly the key users provides a set of opportunities to disseminate educational information, knowledge or practices to improve specific educational aims.

Third, all of the discussions were led by a combination of personal and organisational accounts. This is another indication that the topic of educational innovation is discussed by a wide variety of users and types of organisations. While organisational accounts suggest a larger interest in the topic and a degree of organisation and structure outside online social opportunity spaces, individual accounts show that really anybody can use Twitter to share their insights and contribute to a larger discussion. Differentiated strategies to engage with different types of users (organisations and individuals) reflects another key leverage point in the space. In the mix of personal and organisational accounts and relatively small numbers of influencers driving the discussion, none of them seem to be education research organisations, whether governmental or private. The French example may denote more influence of those governmental actors as governmental content seemed more largely shared. A question for policy makers to promote innovation based on evidence or gain evidence from innovation may include the design of stronger connections to these existing networks.

Fourth, a range of different sub-topics (as identified by different “content communities”) were discussed in the different samples. More specifically, the general topics of “educational technology”, “digital transformation” and the sharing of “good practices” appear to be a type of common denominator across the discussions. Finally, and particularly related to the latter general topic, a closer look at the URLs and media being shared revealed that sharing of best practices was a common phenomenon across samples. This ranged from suggestions on how to use (new) educational technology in classrooms, to very specific experience reports on how a certain educational technology (e.g. video-conferencing tools) have been effectively used in education. Interestingly, across the three cases there was a strong emphasis on the role of technology as core to notions around innovation. This is not surprising given the strong role of technology in driving innovation (and people’s association of the notions). In education, technology use was also one of the main observed changes in most countries’ classroom in the past decade (Vincent-Lancrin et al., 2019[2]).

Conclusions

This study set out to investigate whether and how different aspects of educational innovation are discussed on Twitter in a variety of international settings. It tried to measure the intensity of the discussion around educational innovation topics, the structure and drivers of the corresponding social networks, and the topics of the exchanged contents. Specifically, we considered possible difference between English-speaking (which ended up with a primarily US and UK focus), French-speaking (primarily France and a bit of Canada) and an additional run around Spanish speaking (which ended up with considerable focus on South American countries). The underlying motivation for this distinction was based on the prevalence of English, French and Spanish across OECD countries, and the observation that the corresponding education systems noticeably differ in terms of organisational structures, financial endowment and other characteristics such as the degree of internationalization (OECD, 2018[57]).

Our preliminary findings clearly suggest that Twitter is a social opportunity space (Rehm et al., 2020[31]), wherein the topic of educational innovation is widely discussed in all three samples. (This would also be

the case for other social media.) By enabling users to engage into discussions with a wide variety of other individuals (Tynjälä, 2013[52]) and fostering a process of "*environmental scanning*" (Lohman, 2005, p. 505[56]), Twitter greatly contributes to the discussion about educational innovation. Not only do the applicable Twitter discussions contain information about the latest product and process innovations, but they also provide valuable insights into the interplay between the two, e.g. how educational leaders are introducing and supporting innovations in their immediate surroundings. This in turn has already been identified as a crucial aspect in contributing to make progress and further stimulate educational innovation (Serdyukov, 2017[3]).

Based on these early findings, we therefore conclude that social network analysis can be instrumental for policy makers to better understand and anticipate how communication patterns and discussions about educational innovation develop and evolve within social media spaces, such as Twitter. Furthermore, conducting these types of analyses allows us to potentially profile social media conversations and better understand what type of discussions draw what type of participants and how the dynamics might be influenced by this.

Finally, mapping social media structures can provide 1) topics and 2) information about central users that can be used to invite relevant representatives for a participatory discussion, e.g. EduCamps (Bernhardt and Kirchner, 2010[90]), about policy and make more informed policy decisions. Consequently, Twitter analyses allow tracking and understanding not only educational innovation in general, but also how it is implemented and supported within educational systems. Even more so, as the underlying communication flows resemble a bottom-up approach for educational professionals that often feel neglected in the formal policy processes – e.g. (Ketelaar et al., 2012[4]; Lewin and Stuart, 1993[5]), it can also serve as a vital source of information for policy makers to better understand the views and experiences about innovation of their target audience (e.g. educational professionals and leaders).

The current work should be considered a first step in a wider set of upcoming studies that depart from the indicated notions, conceptual frameworks and findings. Here, we have provided a proof-of-concept and highlighted how mapping out social network structures, visualizing connections and investigating the content that is being shared can contribute to our understanding of how (educational) innovation is discussed and applicable information and insights are being shared. These types of analyses are likely to become even more important and useful in the upcoming years. For example, the global COVID-19 pandemic has influenced new developments in social media. A wide range of preliminary studies has already shown that social media is being used to spread misinformation – e.g. (Brennen et al., 2020[91]; Kouzy et al., 2020[92]) and to counteract these developments – e.g. (Guest, Del Rio and Sanchez, 2020[93]; Van Bavel, Baicker and , 2020[94]). Yet, more detailed analyses are required to get a better understanding of online social opportunity spaces in general and how, beyond the ramifications of the current global pandemic, educational professionals are using them to share resources and eventually transform their daily practice.

Additionally, this study used data from a limited time frame and focused on three languages within the OECD area. Future studies should conduct analyses on data from more prolonged periods of time, in order to be able to more clearly indicate trends and movements. Furthermore, upcoming reports should further expand into other geographical regions (e.g. Asia, Africa, Europe) and incorporate a wider set of languages. One limitation of the approach compared to traditional comparative statistics is that it does not allow providing country statistics with precision – because an account may not be located where it has influence and the geography of the discussions should mainly be inferred by manual checks. For example, the weight of the United States in the English-speaking sample made it primarily a US discussion, in spite of the wide usage of English in other countries.

Possible next steps also include the consideration of other social media outlets, such as Facebook and YouTube, as well as more traditional communication channels, including town hall meetings, letters to the organizing body and newspaper coverage, or again, in the case of education of exchanges within large

national or international platforms for teacher exchange. In order to provide a more holistic view on how educational innovation is discussed within a larger policy context, future studies should also strive to gather more data on the currently neglected types of information (Rehm et al., 2020[9]). Moreover, while this study has focused on educational innovation, Twitter discussions about innovation certainly encompass a wider set of disciplines, including leadership (Park, 2013[95]; Park and Kaye, 2017[96]), health (Chew and Eyesnbach, 2010[97]; Hawn, 2009[98]), technology (Chang, 2011[99]) and response to crisis (Acar and Muraki, 2011[100]; Lachlan et al., 2016[101]). Consequently, possible next steps include the possible expansion of our analyses into these spaces as well.

Furthermore, this study is purely based on quantitative Social Network Analysis data. Future research should consider applying a mixed-methods approach (Fröhlich et al., 2020). This can take on various forms. For example, by adding more advanced semantic analysis, e.g. topic modelling and sentiment analyses (Kabir, Karim and Newaz, 2018[102]; Rehm et al., 2020[31]; Yue et al., 2018[103]), future research could provide more detailed insights into the type of resources being shared, the perceptions of users about different types of (educational) innovation, and what type of experiences users have made when (trying to) introduce innovation in their local settings. Particularly the latter type of information could then further be explored by adding semi-structured interviews (Rehm, Cornelissen, Notten, et al., 2020), as well as qualitative coding of Tweets and resources being shared via Twitter (Moukarzel, Rehm and Daly, 2020[70]; Moukarzel et al., 2020[71]). This would not only allow to collect detailed information about how (educational) innovation is implemented, e.g. in schools, but also what type of hinderances and affordances educational professionals are facing in their local settings.

Finally, while Twitter analyses constitute an important aspect in understanding various aspects of educational innovation, social media are part of a social continuum (Daly et al., 2019[104]) that also includes offline spaces (e.g. within-school face-to-face settings). Hence, future studies should strive to also capture how educational professionals consider, implement and support educational innovation in their relevant and applicable offline spaces, and how the online and offline dimensions supplement each other. This would provide additional dimensions to the findings and contribute to a more holistic view of innovation in education.

Despite possible improvements, expansions and refinements of the methodology, the objective of the chapter was to show what type of information on educational innovation could be collected from a social media analysis for the purpose of international comparisons. It shows that approaching the dynamics of educational innovation within the online sphere is possible and could provide an informative and actionable complement to other forms of measurement and analysis of innovation in education, notably surveys.

References

Acar, A. and Y. Muraki (2011), "Twitter for crisis communication: Lessons learned from Japan's tsunami disaster", *International Journal of Web Based Communities*, Vol. 7/3, pp. 392-402, https://doi.org/10.1504/IJWBC.2011.041206. [100]

Adams Becker, S., M. Brown, E. Dahlstrom, A, Davis, K. DePaul, V. Diaz and J. Pomerantz (2018), *Horizon Report 2018 Higher Education Edition Brought to you by EDUCAUSE*, https://www.learntechlib.org/p/184633/. [26]

Akkerman, S. and A. Bakker (2011), "Boundary Crossing and Boundary Objects", *Review of Educational Research*, Vol. 81/2, pp. 132-169, https://doi.org/10.3102/0034654311404. [54]

Antheunis, M., P. Valkenburg and J. Peter (2012), "The quality of online, offline, and mixed-mode friendships among users of a social networking site", *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, Vol. 6/3, https://doi.org/10.5817/CP2012-3-6. [77]

Archibald, M. and A. Clark (2014), "Twitter and nursing research: How diffusion of innovation theory can help uptake", *Journal of Advanced Nursing*, Vol. 70/3, https://doi.org/10.1111/jan.12343. [79]

Babcock, M., R. Villa Cox and S. Kumar (2019), "Diffusion of pro- and anti-false information tweets: the Black Panther movie case", *Computational and mathematical Organization Theory*, Vol. 25/1, pp. 72-84. [84]

Ball, S. and C. Junemann (2012), *Networks, New Governance and Education*, Policy Press. [34]

Bernhardt, T. and M. Kirchner (2010), *Web 2.0 Meets Conference: The EduCamp as a New Format of Participation and Exchange in the World of Education*, https://doi.org/10.4018/978-1-61520-678-0.ch011. [90]

Bernhard, U. and M. Dohle (2018), "Perceptual processes and political participation: Do the presumed reach and the presumed influence of social media affect political activities via Facebook and Twitter?", *Communications*, Vol. 43/4, pp. 451-467, https://doi.org/10.1515/commun-2017-0052. [87]

Bloch, F., G. Genicot and D. Ray (2008), "Informal insurance in social networks", *Journal of Economic Theory*, Vol. 143/1, pp. 36-58, https://doi.org/10.1016/j.jet.2008.01.008. [22]

Boahin, P. and A. Hofman (2012), "Implementation of innovations in higher education: the case of competency-based training in Ghana", *Innovations in Education and Teaching International*, Vol. 49/3, pp. 283-293, https://doi.org/10.1080/14703297.2012.703021. [28]

Brennen, J., F. M. Simon, P. N. Howard and R. Kleis Nielsen (2020), *Types, sources, and claims of COVID-19 misinformation*. [91]

Burt, R. (2010), *Structural Holes. The Social Structure of Competition*, Harvard University Press, https://doi.org/10.4159/9780674029095. [68]

Chang, H. (2011), "A new perspective on Twitter hashtag use: Diffusion of innovation theory", *Proceedings of the American Society for Information Science and Technology*, Vol. 47/1, https://doi.org/10.1002/meet.14504701295. [99]

Chew, C. and G. Eyesnbach (2010), "Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak", *Plos One*, Vol. 5/11, https://doi.org/10.1371/journal.pone.0014118. [97]

Choo, E., M. Ranney, T. Chan, N. Tueger, A. Walsh, K. Tegtmeyer, S. McNamara, R. Choi and C. Carroll (2015), "Twitter as a tool for communication and knowledge exchange in academic medicine: A guide for skeptics and novices", *Medical Teacher*, Vol. 37/5, https://doi.org/10.3109/0142159X.2014.993371. [18]

Cinelli, M., S. Cresci, A. Galeazzi, W. Quattrociocchi and M. Tesconi (2020), "The limited reach of fake news on Twitter during 2019 European elections", *Plos One*, Vol. 15/6, https://doi.org/10.1371/journal.pone.0234689. [88]

Cornelissen, F., J. van Swet, D. Beijaard and T. Bergen (2011), "Aspects of school–university research networks that play a role in developing, sharing and using knowledge based on teacher research", *Teaching and Teacher Education*, Vol. 27/1, pp. 147-156, https://doi.org/10.1016/j.tate.2010.07.011. [37]

Cross, R. and K. Ehrlich (2008), "Managing Collaboration at the Point of Execution: Improving Team Effectiveness with a Network Perspective", *California Management Review*, Vol. 50/4, pp. 74-98. [86]

Cross, R., T. Laseter, A. Parker and G. Velasquez (2006), "Using Social Network Analysis to Improve Communities of Practice", *California Management Review*, Vol. 49/1, pp. 32-60. [85]

Dabeer, O., A. Karnink and A. Saroop (2011), *Timing Tweets to Increase Effectiveness of Information Campaigns*, https://doi.org/10.1609/icwsm.v5i1.14104. [82]

Daly, A., Y-W. Liou, M. del Fresno García and M. Rehm (2019), "Educational Leadership in the Twitterverse: Social Media, Social Networks, and the New Social Continuum", *Teachers College Record: The Voice of Scholarship in Education*, Vol. 121. [104]

Daly, A., M. Molenaar, J. Bolivar and P. Burke (2010), "Relationships in reform: The role of teachers' social networks", *Journal of educational administration*, Vol. 48/3, pp. 359-391, https://doi.org/10.1108/09578231011041062. [61]

De Corte, E. (1980), "Processes of problem solving: Comparison of an American and a European view", *Instructional Science*, Vol. 9/1, pp. 1-13. [81]

Dumont, H., D. Istance and F. Benavides (eds.) (2010), *The Nature of Learning: Using Research to Inspire Practice*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264086487-en. [19]

Finsterwald, M., P. Wagner, B. Schober, M. Lüftenegger and C. Spiel (2013), "Fostering lifelong learning – Evaluation of a teacher education program for professional teachers", *Teaching and Teacher Education*, Vol. 29/1, pp. 144-155, https://doi.org/10.1016/j.tate.2012.08.009. [8]

Fresno García, M., A. Daly and S. Segado Sánchez-Cabezudo (2016), "Identifying the new Infl uencers in the Internet Era: Social Media and Social Network Analysis", *Revista Española de Investigaciones Sociológicas*, Vol. 153, pp. 23-40, https://doi.org/10.5477/cis/reis.153.23. [65]

Garcia, R., K. Falkner and R. Vivian (2019), "Systematic literature review: Self-Regulated Learning strategies using e-learning tools for Computer Science", *Computers & Education,*, Vol. 123, pp. 150-163, https://doi.org/10.1016/j.compedu.2018.05.006. [12]

Gee, J. (2005), *Semiotic social spaces and affinity spaces: from The Age of Mythology to today's schools*, Cambridge University Press. [44]

Grabowicz, P., J. Ramasco, B. Gonçlaves and V. Eguíluz (2014), "Entangling Mobility and Interactions in Social Media", *Plos One*, Vol. 9/3, pp. 1-12, https://doi.org/10.1371/journal.pone.0092196. [64]

Greenan, N. and E. Lorenz (2013), *Developing harmonized measures of the dynamics of organizations and work*. [25]

Guest, J., C. Del Rio and T. Sanchez (2020), "The Three Steps Needed to End the COVID-19 Pandemic: Bold Public Health Leadership, Rapid Innovations, and Courageous Political Will", *JMIR Public Health Surveill*, Vol. 6/2, https://doi.org/10.2196/19043. [93]

Haelermans, C. (2010), "Innovative power of Dutch secondary education", *Innovation-Management Policy & Practice*, Vol. 12/2, pp. 154-165, https://doi.org/10.5172/impp.12.2.154. [23]

Halász, G. (2018), "Measuring innovation in education: The outcomes of a national education sector innovation survey", *European Journal of Education*, Vol. 53/4, https://doi.org/10.1111/ejed.12299. [24]

Halpin, H., V. Robu and H. Sheperd (2007), *The complex dynamics of collaborative tagging*, https://doi.org/10.1145/1242572.1242602. [74]

Hart, S. and S. Sharma (2004), "Engaging fringe stakeholders for competitive imagination", *Academy of Management Perspective*, Vol. 18/1, https://doi.org/10.5465/ame.2004.12691227. [46]

Hawn, C. (2009), "Take two aspirin and tweet me in the morning: how Twitter, Facebook, and other social media are reshaping health care", *Health Affairs*, Vol. 28/2, pp. 361-368, https://doi.org/10.1377/hlthaff.28.2.361. [98]

Ito, M., K. Gutierrez, S. Livingstone, B. Penuel, J. Rhodes, K. Salen, J. Schor, J. Sefton-Green and S. Watkins (2012), *Connected Learning: An Agenda for Research and Design*. [48]

Kabir, A., R. Karim and S. Newaz (2018), "The Power of Social Media Analytics: Text Analytics Based on Sentiment Analysis and Word Clouds on R", *Informatica Economica*, Vol. 22/1. [102]

Kalyuga, S. and A. Singh (2016), "Rethinking the Boundaries of Cognitive Load Theory in Complex Learning", *Educational Psychology Review*, Vol. 28, pp. 831–852, https://doi.org/10.1007/s10648-015-9352-0. [17]

Ketelaar, E., D. Beijaard, H. Boshuizen and P. Den Brok (2012), "Teachers' positioning towards an educational innovation in the light of ownership, sense-making and agency", *Teaching and Teacher Education*, Vol. 28/2, https://doi.org/10.1016/j.tate.2011.10.004. [4]

Kirschner, P., J. Sweller, F. Kirshner and J. Zambrano (2018), "From Cognitive Load Theory to Collaborative Cognitive Load Theory", *International Journal of Computer-Supported Collaborative Learning*, Vol. 13, pp. 213-233, https://doi.org/10.1007/s11412-018-9277-. [109]

Klijn, E. and J. Koppenjan (2012), "Governance Network Theory: Past, Present and Future", *Policy & Politics*, Vol. 40/4, pp. 587-606, https://doi.org/10.1332/030557312X655431. [35]

Koene, A., E. Perez, C.J. Carter, R. Statache, S. Adolphs, C. O'Malley, T. Rodden and D. McAuley (2015), *Research ethics and public trust, preconditions for continued growth of internet mediated research - public confidence in internet mediate research*, SciTePress. [72]

Kolb, A. and D. Kolb (2017), "Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education", *Academy of Management Learning & Education*, Vol. 4/2, pp. 193-212, https://doi.org/10.5465/amle.2005.17268566. [49]

Kolb, D. (1984), *Experiential Learning: Experience As The Source Of Learning And Development*, Prentice-Hall. [53]

Kouzy, R., J. Abi Jaoude, A. Kraitem, M. B. El Alam, B. Karam, E. Adib, J. Zarka, C. Traboulsi, E. W. Akl and K. Baddour (2020), "Coronavirus Goes Viral: Quantifying the COVID-19 Misinformation Epidemic on Twitter", *Cureus*, Vol. 12/3, https://doi.org/10.7759/cureus.7255. [92]

Lachlan, K., P. Spence, X. Lin, K. Najarian and M. Del Greco (2016), "Social media and crisis management: CERC, search strategies, and Twitter content", *Computers in Human Behavior*, Vol. 54, pp. 647-652, https://doi.org/10.1016/j.chb.2015.05.027. [101]

Latapy, M., C. Magnien and N. Del Vecchio (2008), "Basic notions for the analysis of large two-mode networks", *Social Networks*, Vol. 30/1, pp. 31-48, https://doi.org/10.1016/j.socnet.2007.04.006. [75]

Lech, K., L. Hoople, K. Abiker, M. Mitchell and P. Mooney (2017), "Students as producers and active partners in enhancing equality and diversity: 'culturosity' at Canterbury Christ Church University", *Journal of Educational Innovation, Partnership and Change*, Vol. 3/2, pp. 2055-4990, https://doi.org/10.21100/jeipc.v3i2.533. [15]

Lee, J., M. DeCamp, M. Dredze, M. Chisolm and Z.D. Berger (2014), "What are health-related users tweeting? A qualitative content analysis of health-related users and their messages on twitter", *Journal of medical Internet Research*, Vol. 16/10, https://doi.org/10.2196/jmir.3765. [69]

Lee, U., B. Zhou, M. Gerla, E. Magistretti, P. Bellavista and A. Corradi (2006), "Mobeyes: smart mobs for urban monitoring with a vehicular sensor network", *IEEE Wireless Communications*, Vol. 10/5, pp. 52-57, https://doi.org/10.1109/WC-M.2006.250358. [47]

Letierce, J., A. Passant, S. Decker and J.G. Breslin (2010), "Understanding how Twitter is used to spread scientific messages". [59]

Lewin, K. and J. Stuart (1993), *Educational Innovation in Developing Countries: Case-Studies of Changemakers*, Springer. [5]

Lohman, M. (2005), "A survey of factors influencing the engagement of two professional groups in informal workplace learning activities", *Human Resource Development Quarterly*, Vol. 16, pp. 501-527, https://doi.org/10.1002/hrdq.1153. [56]

Marotzki, W. (2004), *Von der Medienkompetenz zur Medienbildung*. [41]

Marotzki, W. and B. Jörissen (2008), *Medienbildung*, https://doi.org/10.1007/978-3-531-91158-8_11. [43]

McLay, K. and V. Reyes (2019), "Identity and digital equity: Reflections on a university educational technology course", *Australasian Journal of Educational Technology*, Vol. 35/6, pp. 15-29, https://doi.org/10.14742/ajet.5552. [14]

McNeill, A., P. Harris and P. Briggs (2016), "Twitter Influence on UK Vaccination and Antiviral Uptake during the 2009 H1N1 Pandemic", *Frontiers in Public Health*, Vol. 4, https://doi.org/10.3389/fpubh.2016.00026. [80]

McPherson, M., K. Budge and N. Lemon (2015), "New practices in doing academic development: Twitter as an informal learning space", *International Journal for Academic Development*, Vol. 20/2, pp. 126-136, https://doi.org/10.1080/1360144X.2015.1029485. [51]

Mesch, G. and I. Talmud (2006), "The Quality of Online and Offline Relationships: The Role of Multiplexity and Duration of Social Relationships", *The Information Society*, Vol. 22/3, pp. 137-148. [78]

Moreno, M., N. Goniu, P. S. Moreno and Douglas Diekema (2013), "Ethics of Social Media Research: Common Concerns and Practical Considerations", *Cyberpsychology, Behavior, and Social Networking*, Vol. 16/9, pp. 708-713, https://doi.org/10.1089/cyber.2012.0334. [73]

Moukarzel, S., M. Rehm, M. del Fresno and A. Daly (2020), "Diffusing science through social networks: The case of breastfeeding communication on Twitter", *Plos One*, https://doi.org/10.1371/journal.pone.0237471. [71]

Moukarzel, S., M. Rehm and A. Daly (2020), "Breastfeeding promotion on Twitter: A social network and content analysis approach", *Maternal & Child Nutrition*, Vol. 16/4, https://doi.org/10.1111/mcn.13053. [70]

Mynatt, E., V. O'Day and A. Adler (1998), "Network Communities: Something Old, Something New, Something Borrowed ...", *Computer Supported Cooperative Work (CSCW)*, pp. 123-156, https://doi.org/10.1023/A:1008688205872. [50]

Newman, M. (2006), "Modularity and community structure in networks", *Proceedings of the National Academy of Sciences*, Vol. 103/23, pp. 8577-5852, https://doi.org/10.1073/pnas.0601602103. [66]

Noack, A. (2009), "Modularity clustering is force-directed layout", *Physical Review E*, Vol. 79/2, https://doi.org/10.1103/PhysRevE.79.026102. [67]

OECD (2018), *OECD Handbook for Internationally Comparative Education Statistics 2018: Concepts, Standards, Definitions and Classifications*, OECD Publishing, https://doi.org/10.1787/9789264304444-en. [57]

OECD (2016), *Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264265097-en. [10]

OECD (2014), *Measuring Innovation in Education: A New Perspective*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264215696-en. [1]

OECD (2013), *Leadership for 21st Century Learning*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264205406-en. [30]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en. [21]

Owen, N., A. Fox and T. Bird (2016), "The development of a small-scale survey instrument of UK teachers to study professional use (and non-use) of and attitudes to social media", *International Journal of Research & Method in Education*, Vol. 39/2, pp. 170-193, https://doi.org/10.1080/1743727X.2015.1041491. [39]

Pancer, E. and M. Poole (2016), "The popularity & virality of political social media: Hashtags, mentions, and links predict likes & retweets of 2016 U.S. presidential nominees' tweets", *Social Influence*. [83]

Park, C. (2013), "Does Twitter motivate involvement in politics? Tweeting, opinion leadership, and political engagement", *Computers in Human Behavior*, Vol. 29/4, pp. 1641-1648, https://doi.org/10.1016/j.chb.2013.01.044. [95]

Park, C. and B. Kaye (2017), "The tweet goes on: Interconnection of Twitter opinion leadership, network size, and civic engagement", *Computers in Human Behaviour*, Vol. 69, pp. 174-180, https://doi.org/10.1016/j.chb.2016.12.021. [96]

Park, J., Y. Baek and M. Cha (2014), "Cross-cultural comparison of nonverbal cues in emoticons on Twitter: Evidence from big data analysis", *Journal of Communication*, Vol. 64/2, pp. 333-354, https://doi.org/10.1111/jcom.12086. [76]

Pierre, J. and G. Peters (2000), *Governance, Politics and the State*, Macmillan. [36]

Polák, P. (2017), "The productivity paradox: A meta-analysis", *Information Economics and Policy*, Vol. 38, pp. 38-54. [16]

Prain, V., P. Cox, C. Deed, J. Dorman, D. Edwards, C. Farrelly, M. Keeffe, V. Lovejoy, L. Mow, P. Sellings, B. Waldrip and Z. Yager (2013), "Personalised learning: lessons to be learnt", *British educational research journal*, Vol. 39/4, pp. 654–676. [13]

Prince Machado, M., G. Tenorio Sepúlveda and M. Ramirez Montoya (2016), "Educational innovation and digital competencies: the case of OER in a private Venezuelan university", *International Journal of Educational Technology in Higher Education*, Vol. 13/1, https://doi.org/10.1186/s41239-016-0006-1. [29]

Rehm, M., F. Cornelissen, A. Daly and M. Del Fresno García (2020), "Drinking from the Firehose: The Structural and Cognitive Dimensions of Sharing Information on Twitter", *American Journal of Education*, Vol. 127/1, https://doi.org/10.1086/711014. [31]

Rehm, M., F. Cornelissen, A. Notten, A. Daly and J. Supovitz (2020), *Power to the People?! Twitter Discussions on (Educational) Policy Processes*. [9]

Rehm, M. and A. Notten (2016), "Twitter as an informal learning space for teachers!? The role of social capital in Twitter conversations among teachers", *Teaching and Teacher Education*, Vol. 60, pp. 215-223, https://doi.org/10.1016/j.tate.2016.08.015. [32]

Resta, P., T. Laferrière, R. McLaughlin and A. Kouraogo (2018), *Issues and Challenges Related to Digital Equity: An Overview*, Springer, https://doi.org/10.1007/978-3-319-71054-9_67. [107]

Rheingold, H. (2007), *Smart mobs: The next social revolution*, Basic Books. [45]

Richardson, J. (ed.) (2019), *Bringing Innovative Practices to Your School*, Routledge, https://doi.org/10.4324/9780429197062. [106]

Risser, H. (2013), "Virtual induction: A novice teacher's use of Twitter to form an informal mentoring network", *Teaching and Teacher Education*, Vol. 35, pp. 25-33, https://doi.org/10.1016/j.tate.2013.05.001. [40]

Rovers, S., G. Clarebout, H. C. M. Savelberg, A. de Bruin and J. van Merriënboer (2019), "Granularity matters: comparing different ways of measuring self-regulated learning", *Metacognition and Learning*, Vol. 14, pp. 1-19, https://doi.org/doi.org/10.1007/s11409-019-09188-6. [105]

Schlager, M., U. Farooq, J. Fusco, P. Schank and N. Dwyer (2009), "Analyzing Online Teacher Networks: Cyber Networks Require Cyber Research Tools", *Journal of Teacher Education*, Vol. 60/1, pp. 86-100, https://doi.org/10.1177/0022487108328487. [62]

Schleicher, A. (ed.) (2012), *Preparing Teachers and Developing School Leaders for the 21st Century: Lessons from around the World*, International Summit on the Teaching Profession, OECD Publishing, Paris, https://doi.org/10.1787/9789264174559-en. [20]

Scott, J. (2017), *Social Network Analysis*, SAGE Publications Ltd, https://doi.org/10.4135/978152971659. [63]

Serdyukov, P. (2017), "Innovation in education: What works, what doesn't, and what to do about it", *Journal of Research in Innovative Teaching & Learning*, Vol. 10/1, pp. 4-33, https://doi.org/10.1108/JRIT-10-2016-0007. [3]

Spanhel, D. (2010), *Mediale Bildungsräume. Ihre Erschließung und Gestaltung als Handlungsfeld der Medienpädagogik*, Kopaed. [42]

Supovitz, J., A. Daly and M. del Fresno (2015), *#CommonCore: How social media is changing the politics of education*, https://repository.upenn.edu/hashtagcommoncore/1/. [33]

Tang, H. and A. Carr-Chellman (2016), "Massive Open Online Courses and Educational Equality in China: A Qualitative Inquiry", *Journal of Educational Technology Development and Exchange (JETDE)*, Vol. 9/1, pp. 49-66, https://doi.org/10.18785/jetde.0901.04. [108]

Thorn, W. and S. Vincent-Lancrin (2021), *Schooling During a Pandemic: The Experience and Outcomes of Schoolchildren During the First Round of COVID-19 Lockdowns*, OECD Publishing, Paris, https://doi.org/10.1787/1c78681e-en. [7]

Tynjälä, P. (2013), "Toward a 3-P Model of Workplace Learning: a Literature Review", *Vocations and Learning*, pp. 11-36, https://doi.org/10.1007/s12186-012-9091-z. [52]

Van Bavel, J., K. Baicker and B. (2020), "Using social and behavioural science to support COVID-19 pandemic response", *Nature Human Behaviour*, Vol. 4, pp. 460-471, https://doi.org/10.1038/s41562-020-0884-z. [94]

Van Lieshout, K., A. Arundel and S. Vincent-Lancrin (2023), "Measuring innovation through surveys: Main considerations and applications to education" in Vincent-Lancrin, S. (ed.), *Measuring Innovation in Education 2023: Tools and Methods for Data-Driven Action and Improvement*, OECD Publishing. [11]

Venkatesh, V., M. Morris, G. Davis and F. Davis (2003), "User Acceptance of Information Technology: Toward a Unified View", *MIS Quarterly*, Vol. 27/3, pp. 425-478. [110]

Vincent-Lancrin, S. (2020), “Monitoring innovation in education to improve education policies and outcomes in OECD countries”, *IUL Research*, Vol. 1/1, https://doi.org/10.57568/iulres.v1i1.44. [27]

Vincent-Lancrin, S., C. Cobo Romaní and F. Reimers (eds.) (2022), *How Learning Continued during the COVID-19 Pandemic: Global Lessons from Initiatives to Support Learners and Teachers*, OECD Publishing, Paris, https://doi.org/10.1787/bbeca162-en. [6]

Vincent-Lancrin, S., J. Urgel, S. Kar and G. Jacotin (2019), *Measuring Innovation in Education 2019: What Has Changed in the Classroom?*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/9789264311671-en. [2]

Wasserman, S. and K. Faust (1994), *Social Network Analysis: Methods and Applications*, Cambridge University Press, https://doi.org/10.1017/CBO9780511815478. [60]

Wekerle, C., N. Vakili, S. Stewart and T. Black (2018), “The utility of Twitter as a tool for increasing reach of research on sexual violence.”, *Child Abuse & Neglect*, Vol. 85, https://doi.org/10.1016/j.chiabu.2018.04.019. [89]

Wellman, B. (2001), “Computer Networks As Social Networks”, *Science*, Vol. 293/5537, pp. 2031-2034, https://doi.org/10.1126/science.1065547. [38]

Williams, D. (2006), “On and off the ’Net: Scales for Social Capital in an Online Era”, *Journal of Computer-Mediated Communication*, Vol. 11/2, pp. 593–628, https://doi.org/10.1111/j.1083-6101.2006.00029.x. [55]

Ye, Q., B. Fang, W. He and J. Po-An Hsieh (2012), “Can Social Capital be Transferred Cross the Boundary of the Real and Virtual Worlds? An Empirical Investigation of Twitter”, *Journal of Electronic Commerce Research*, Vol. 13/2, pp. 145-156, http://www.jecr.org/node/51. [58]

Yue, L., W. Chen, X. Li, W. Zuo and M. Yin (2018), “A survey of sentiment analysis in social media”, *Knowledge and Information Systems*, Vol. 60, pp. 617–663, https://doi.org/10.1007/s10115-018-1236-4. [103]

[1] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190312-1.

[2] The applicable metrics and Social Network Analysis visualisations were determined using a combination of software packages. On the one hand, we used the statistical software environment R. Here, we used the libraries “data.table”, “stringr” and “igraph”, to clean and transform the raw Twitter data into Social Network Analysis compatible formats. On the other hand, we used the open graph visualisation platform gephi to produce sociograms.

[3] (innovación OR innovación) AND (educación OR educación).

[4] Please note that the Social Runner Lab was updated in between data collection runs. Consequently, the figures representing the distribution across time look slightly different.

Part III Measuring educational R&D

8 Public budget and expenditures in educational R&D: towards a new generation of international indicators?

Stéphan Vincent-Lancrin, OECD[3]

Research and Experimental Development (R&D) is a key driver of innovation in all sectors of society. This chapter presents international statistics about countries' public investment in educational research and experimental development, showing that public educational R&D is one of the least funded socio-economic objectives. The chapter also highlights the limitations of available data proposes strategies to improve them.

[3] Gwénaël Jacotin (OECD) is gratefully acknowledged for his excellent statistical work and the preparation of the tables and figures. Fernando Galindo-Rueda and Guillaume Kpodar at the OECD Directorate for Science, Technology and Innovation are thanked for their advice and for generously sharing their expertise.

Introduction

In most sectors, public and private research and experimental development (R&D) expenditures constitute a good indicator of the intensity of product and process innovation. Thus, a key measure in innovation policy is to fund and stimulate public research, partly in alignment with governmental priorities, partly leaving researchers identify strategic research areas, generally by means of a tax policy to encourage private investment in R&D and by funding university researchers and government research agencies (OECD, 2015[1]; OECD, 2023[2]). Additionally, political and administrative entities increasingly require scientific knowledge as a basis for effective decision making. Increasing demand for usable knowledge, from policy makers and practitioners, has further developed national frameworks of educational R&D and constitutes an additional source of innovation in education (OECD, 2022[3]; OECD, 2007[4]).

The size, structure and characteristics of such national educational R&D systems remain largely obscure, as few comparative studies have approached the subject systematically. Data on staff and on R&D expenditure in education in eight OECD countries were published in *Education at a Glance 1995* (OECD, 1995[5]). At the time, educational R&D seemed to be a minor activity compared to the size of educational systems as a whole and R&D activities in other fields of science. The impact of educational R&D was deemed insignificant, and the International Indicators of Education Systems project (INES) resolved not to include the R&D indicators in posterior editions of Education at a Glance (McKenzie, 2007[6]). This is still the case in 2023.

This chapter presents and discusses measures of public educational R&D through the analysis of existing data collections within OECD and partner countries. Collected and compiled at the OECD by the Working Party of National Experts on Science and Technology Indicators (NESTI), these data collections follow the guidelines established in the different editions of the Frascati Manual (OECD, 2015[7]; OECD, 2002[8]), and focus on the inputs of research and development processes. The chapter presents the latest educational R&D indicators for 35 countries, presents some data collections that were discontinued at the international level, and discusses the limitations of available data. It ends by proposing strategies to collect more reliable comparative data on educational R&D.

Public budget for educational R&D

The government budget allocation to research and development (also known as GBARD) is currently the most widely available indicator of educational R&D funding in OECD countries. This is the public budget allocated to R&D. This indicator essentially "seeks to ascertain government intentions or objectives when committing money to R&D" (OECD, 2002[8]). The government budget allocations are derived from national budgets.

Their allocation between different fields is earmarked following the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS), more commonly referred to as socio-economic objectives. They thus enable to compare the public research budgets allocated to different purposes. The 2007 modification of the NABS classification system elevated "education" to the status of main socio-economic objective. Since then, a measure of R&D funding oriented towards education has been reported yearly by most OECD countries.

In 2020 nearly all countries reported their public R&D budget, and 34 countries earmarked its education share. This is the main information available to assess countries' public educational research budget.

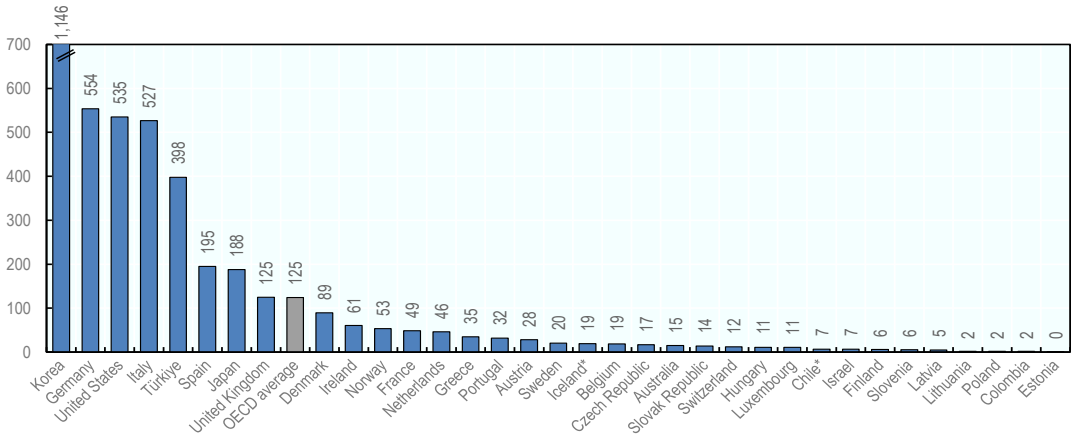
Public budget allocated to educational R&D

Figure 8.1 shows the educational research budget allocation in millions of US dollars (in purchasing power parities to make the values comparable across countries). In 2020, an OECD country allocated on average

USD 125 million to educational R&D (and the cumulative amount for all countries for which information is available amounted to USD 4.4 billion). Korea had the greatest public research budget for education, allocating more than 1 100 million, exceeding by far the next largest allocations: Germany (554), United States (at the federal level) (535), Italy (527) and Türkiye (398). Most countries allocate less than the country average – with a median at USD 19 million.

Figure 8.1. Public research budget for education, 2020

GBARD for education - Million PPP US dollars - 2015 Constant prices

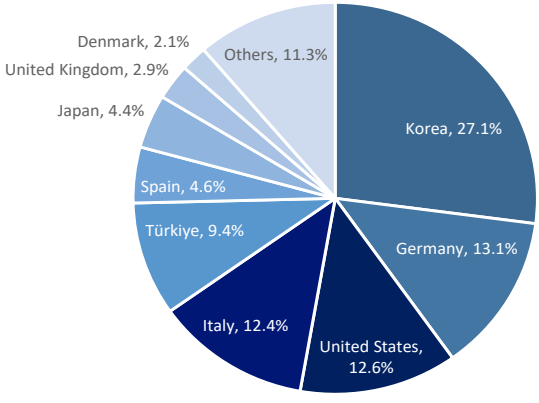


Note: * 2019 instead of 2020

StatLink https://stat.link/kltncy

Figure 8.2. Distribution of public educational R&D budget across OECD countries

Percentage of total budget allocation for educational R&D in the OECD area



Note: Read: The budget for public educational research in Korea represents 27.1% of the total public R&D budget for education in the OECD area.

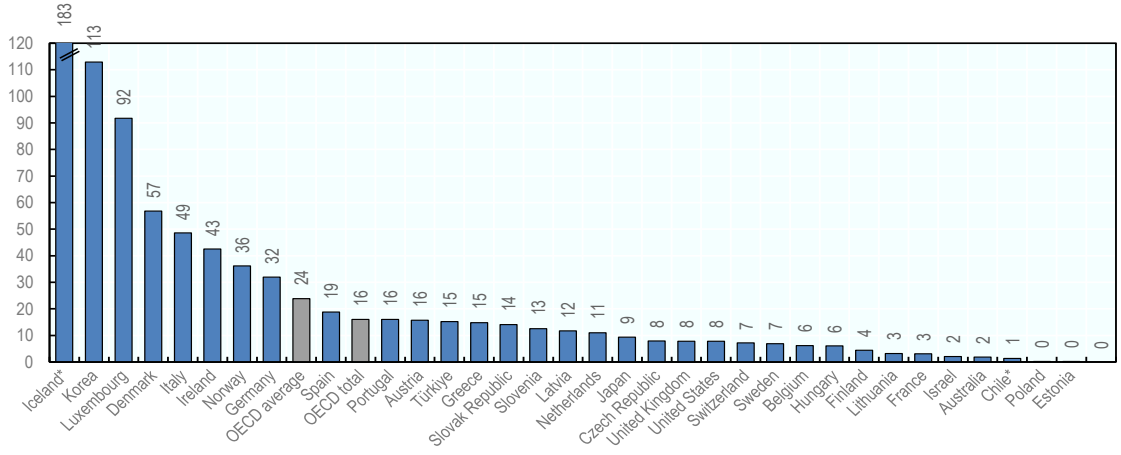
StatLink https://stat.link/egvk70

Figure 8.2 presents how the total educational R&D funding is distributed across countries. The budget for educational research in the OECD area is concentrated in a small number of countries. Korea, Germany and the United States account for over 50% of the budget.

Figure 8.3 presents the public educational research budget per student (calculated using 2020 enrolments at all levels of education). It offers a relative measure that accounts for the size of the countries' educational systems. This analysis not only flattens out the difference between the greatest and lowest public research allocations to education, but also highlights a distinct group of top funding countries. In 2020, Iceland allocated the largest relative educational research budget per student with USD 183, followed by Korea (113) and Luxembourg (92). The country mean stood at USD 24 per student and the median at USD 11, thus leaving Korea, Germany and Italy as the only countries above average in both absolute and relative terms.

Figure 8.3. Public educational R&D budget per student, 2020

GBARD for education per student (all levels of education) - PPP US dollars, 2015 constant prices



Note: * 2019 instead of 2020. Read: In Spain, the public budget for educational R&D corresponds to USD 19 per student in formal education.

StatLink https://stat.link/3g1cbs

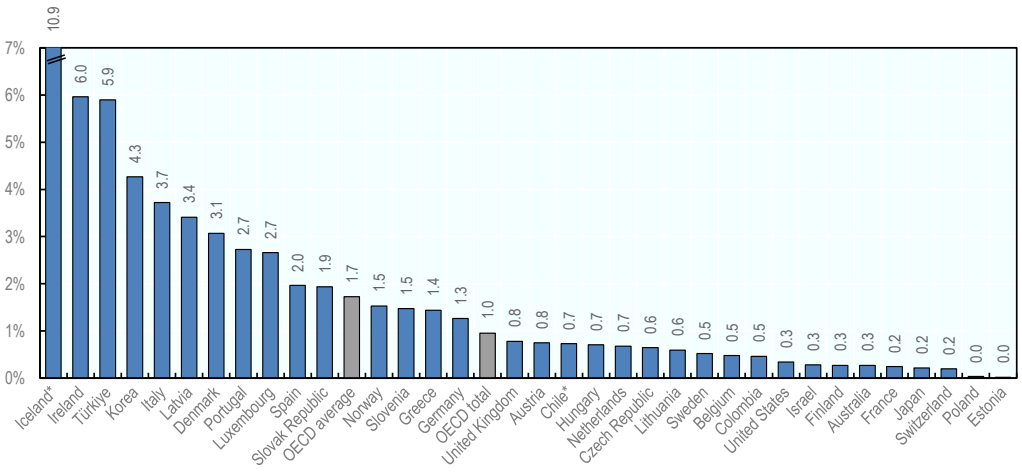
Share of public R&D allocated to educational R&D

In 2020, an OECD country allocated on average 1.7% of its public research budget on educational research. This appears to be relatively small given that an OECD country spent on average 5.8% of its GDP on education in 2019. There are large differences across countries, with a majority of countries (19) allocating less than 1% to educational R&D, eight between 1 and 3%, and seven over 3%. In total, taking into account the actual amount of the budget allocations, 1% of the total OECD budget for public R&D was allocated to educational R&D.

In the past decade, public educational research budgets have increased though. In 2010, a country allocated 1.1% of its public research budget to education (against 1.5% for countries for which data are available in 2010 and 2020). Figure 8.4 shows that on average the amounts allocated to public educational research (in constant prices) have increased by 5% a year and increased in almost all countries, and that the share of educational research in the total public research has also increased, albeit at a lower pace of 2%.

Figure 8.4. Share of the public research budget allocated to educational R&D, 2020

Share of GBARD for education in total GBARD



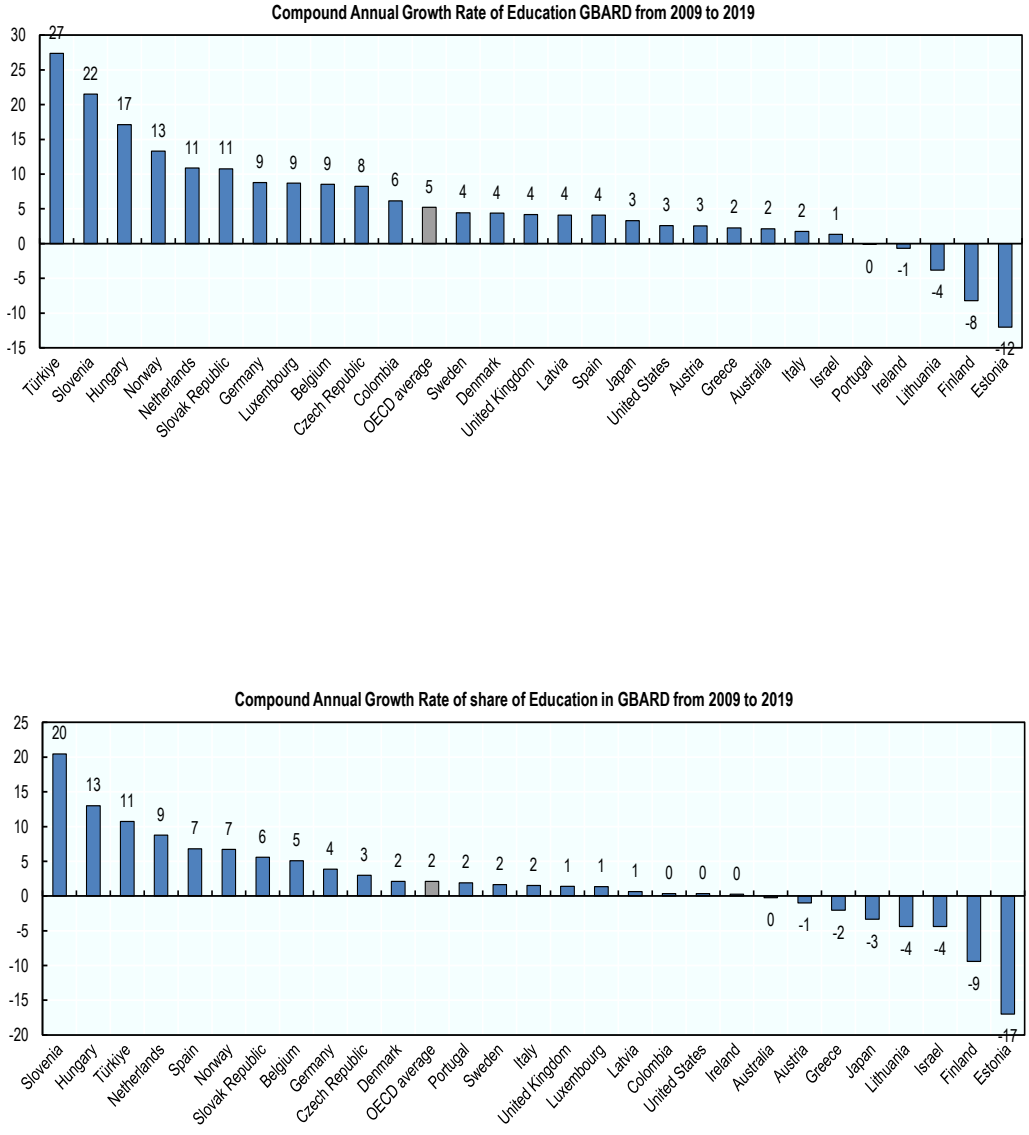
Note: * 2019 instead of 2020

StatLink https://stat.link/u1kjvt

Figure 8.5 presents this evolution in a combined way, showing more clearly that most countries have tried to boost educational research compared to other sectors. From 2009 and 2019, the share of educational R&D in the total public R&D increased by 48% and the budget of educational R&D more than doubled (with a 124% increase). In most of countries, both measures move in same direction, increasing sometimes a lot, like in Hungary, the Netherlands, Slovenia and Türkiye where there were multiplied by more than two. At the opposite side, there are some countries such as Estonia and Finland in which both education GBARD and share of education were divided by two.

Figure 8.5. Growth rate of public educational R&D budget from 2009 to 2019, in value and as a share of the total public research budget

3-year centred moving averages, based on 2015 constant prices for budget amounts

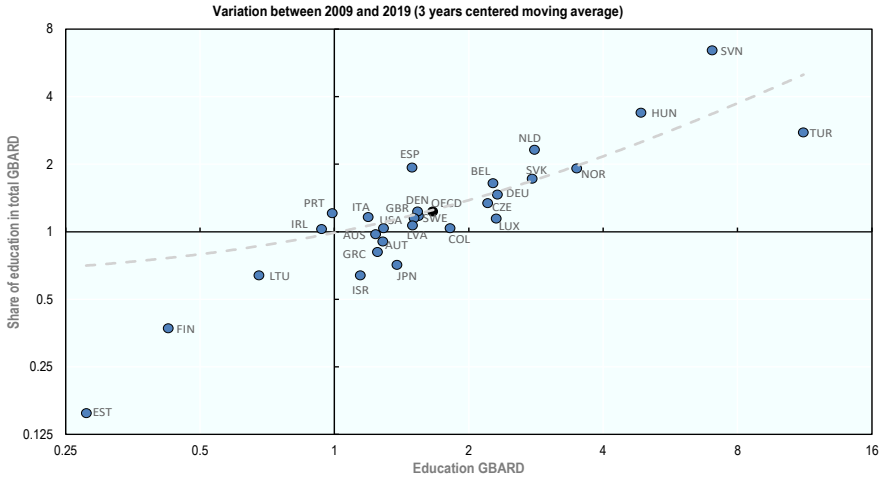


Note: On average, the public budget for educational R&D grew by 5% per year in an OECD country (in constant prices and purchasing power parities) and the growth rate of public educational R&D in the share of total public R&D amounted to 2%. A negative growth rate denotes a decrease while a positive one an increase.

StatLink https://stat.link/o3pybg

Figure 8.6. Combined annual growth of public educational R&D and of share of education in public R&D budget, 2009-2019

3-year centred moving averages, based on national currencies for budget amounts



Note: The two axes denote stability between 2009 and 2019. 1 means that the public educational R&D budget (GBARD) was identical in 2009 and 2019 in constant prices or that the share of education in the total public R&D budget remained the same. 0.5 means that it was halved, and 2 that it was doubled. The top right quadrant shows countries where both the amount and share of educational research have increased. The bottom left quadrant, where they have both decreased. The top left quadrant means that the amount of public research budget for education has decreased but that its share in the total public research has increased (meaning that the total amount of public research budget has decreased). The bottom right quadrant means that the amount of publica educational research has increased, but at a lower pace than what was allocated to other socio-economic objectives.

StatLink https://stat.link/mwsl54

Educational R&D compared to other socio-economic objectives

Comparing the public budget devoted to educational R&D to that of other sectors of society and the economy provides another perspective on governments' investment in educational R&D. Table 8.1 presents the distribution of the public R&D budget to different socio-economic objectives. The OECD average shows what a country spends on average for each domain, while the OECD total shows how much budget is allocated to each socio-economic budget for the whole OECD area. For example, while an OECD country allocates 4% to defence R&D, the defence budget within the OECD represents 19% of all public R&D expenditures given the allocations to defence R&D in some countries.

A feature, common to all OECD countries, emerges when comparing education to other socio-economic objectives. On average, education receives the second smallest share of the public research budget compared to all other socio-economic objectives (Table 8.1) – after culture, recreation, religion and mass media. In nine countries (out of 34 for which data are available) it was the least funded socio-economic objective (Australia, Colombia, Czech Republic, Estonia, Finland, Germany, Greece, Poland, United Kingdom) and, in 22 countries, one of the three least funded objectives in the public R&D budget. The average share allocated to educational research compares to other socio-economic objectives like "culture, recreation, religion and mass media" (1.3%), "political and social systems, structures and processes" (2.3%), "exploration and exploitation of the earth" (2.3%), "transport, telecommunication and other infrastructures" (2.5%) "environment" (2.6%), "exploration and exploitation of space" (2.6%), and "energy" (3.1%). A second group of socio-economic objectives which on average receive close to 4-5% of total allocations comprise "defence" (4%) and "agriculture" (5.1%). The socio-economic objectives of "health" and "industrial production

and technology" received on average large public research allocations: 9.3% and 12% of the total public research budget, respectively.

When looking at the allocation of budget at the OECD (rather than country) level, educational R&D remains the second last public research budget after culture, at 1% of the total public research budget – almost halved compared to the country average. Defence (19.7%) trumps general university funds for the general advancement of knowledge (17.3%), health (15.9%) and industrial production and technology (12.1%). In terms of overall public research budget, educational R&D (1%) compares with public R&D on culture, recreation and religion (0.5%), political and social systems, structures and processes (1.1%), exploration and exploitation of the Earth (1.4%) and environment (1.7%).

Figure 8.7 presents the relative size of educational research compared to some other fields of research: each panel showcases countries' public R&D (GBARD) allocations to agriculture, defence and health objectives as a factor of their public educational R&D budget. Agriculture is an interesting sector for education as it successfully managed its transition to a more "evidence-based" sector. Health is important as another social sector, while defence imports as a sector for which governmental R&D will mainly come from, for obvious reasons.

On average an OECD country assigned three times as much public budget for R&D to agriculture as to education. Only in Luxembourg, Iceland, Italy, Portugal and Türkiye was the budget allocation in the opposite direction.

As regards defence, the United States stands out: its absolute public education R&D budget allocation is the third largest among all OECD countries, but educational R&D represents 0.7% of its public budget for military and defence-related research (and 0.3% of its overall federal governmental R&D budget). Eleven OECD countries reported public educational R&D budgets larger than their public defence R&D budget (Austria, Denmark, Hungary, Ireland, Iceland, Israel, Italy, Latvia, Luxembourg, Portugal, Spain). Still, an OECD countries assigned on average about 2.3 times as much resources to defence as to education research (1.5 times as much, excluding the United States). And 20.5 as much to defence as to education in terms of overall OECD R&D budget appropriation.

Health research also receives significantly more public funding than education. On average, OECD countries assigned five times as much resources to health research as to education. The United States, Australia and France allocate respectively as much as 83, 69 and 50 times as much funds to public R&D on health as to educational R&D. Among OECD countries, only Iceland and Türkiye assigns more R&D funds to education than to health. In absolute terms, the public OECD budget for health R&D is 16-fold the public budget for educational R&D.

Table 8.1. Percentage of public R&D budget allocations by socio-economic objective, 2020

	Agriculture	Culture, recreation, religion and mass media	Defence	Education	Energy	Environment	Exploration and exploitation of space	Exploration and exploitation of the Earth	GAK: R&D financed from General University Funds (GUF)	GAK: R&D financed from sources other than GUF	Health	Industrial production and technology	Political and social systems, structures and processes	Transport, telecommunication and other infrastructures
Australia	8.5%	0.5%	6.2%	0.3%	4.2%	3.3%	0.4%	5.6%	34.4%	8.0%	18.7%	6.6%	1.4%	2.1%
Austria	1.2%	0.5%	0.1%	0.8%	3.5%	2.7%	0.7%	1.4%	56.6%	12.6%	4.6%	13.0%	1.1%	1.2%
Belgium		1.4%	0.7%	0.5%	1.7%	0.6%	8.4%	2.5%	17.5%	23.7%	2.3%	36.1%	4.0%	0.5%
Chile*	14.4%	0.1%	0.0%	0.7%	1.9%	1.3%	0.0%	4.6%	9.0%	59.3%	3.0%	3.3%	1.5%	0.7%
Colombia	23.7%	1.3%	0.9%	0.5%	1.0%	15.6%	0.0%	19.4%	NA	4.1%	16.7%	10.6%	5.0%	1.2%
Czech Republic	4.1%	0.7%	1.0%	0.6%	4.4%	2.1%	1.8%	1.9%	23.6%	34.4%	7.1%	11.7%	2.1%	4.5%
Denmark	3.0%	1.5%	0.3%	3.1%	3.6%	1.2%	1.1%	0.4%	46.2%	14.3%	14.8%	8.3%	2.1%	0.1%
Estonia	5.3%	0.7%	2.4%	0.0%	0.1%	1.3%	1.6%	1.1%	18.7%	61.5%	1.8%	1.3%	3.9%	0.1%
Finland	2.6%	0.4%	2.0%	0.3%	2.8%	3.0%	1.2%	0.7%	30.2%	27.6%	2.8%	21.4%	3.4%	1.6%
France	2.2%	0.8%	8.6%	0.2%	7.3%	1.8%	14.2%	0.8%	24.1%	22.4%	12.3%	0.9%	0.1%	4.3%
Germany	2.8%	1.1%	4.2%	1.3%	5.7%	2.7%	4.4%	1.4%	37.3%	14.5%	7.5%	13.4%	1.9%	1.9%
Greece	3.0%	10.2 %	1.6%	1.4%	2.2%	4.2%	1.7%	1.9%	31.4%	3.9%	10.8%	15.7%	5.8%	6.3%
Hungary	7.1%	1.8%	0.3%	0.7%	2.6%	4.3%	5.0%	2.0%	2.1%	19.1%	19.7%	29.9%	2.2%	3.2%
Iceland*	3.1%	0.0%	0.0%	10.9%	0.4%	0.0%	0.0%	0.7%	44.4%	24.4%	1.4%	14.4%	0.3%	0.0%
Ireland	10.7%	0.4%	0.0%	6.0%	0.9%	1.9%	2.7%	1.3%	17.0%	32.3%	6.8%	19.0%	0.6%	0.3%
Israel	4.9%	0.6%		0.3%	0.4%	0.7%	0.5%	1.0%	49.7%	3.5%	0.6%	33.6%	1.4%	2.7%
Italy	2.7%	0.6%	0.5%	3.7%	3.3%	2.9%	13.9%	5.5%	38.2%	1.7%	12.4%	10.0%	3.1%	1.5%
Japan	2.8%	0.0%	1.5%	0.2%	5.6%	2.7%	3.8%	0.6%	18.7%	14.7%	7.7%	33.7%	0.4%	7.6%
Korea	4.6%		16.6%	4.3%	5.3%	3.2%	1.7%	0.9%	NA	21.0%	8.3%	28.4%	2.3%	3.5%

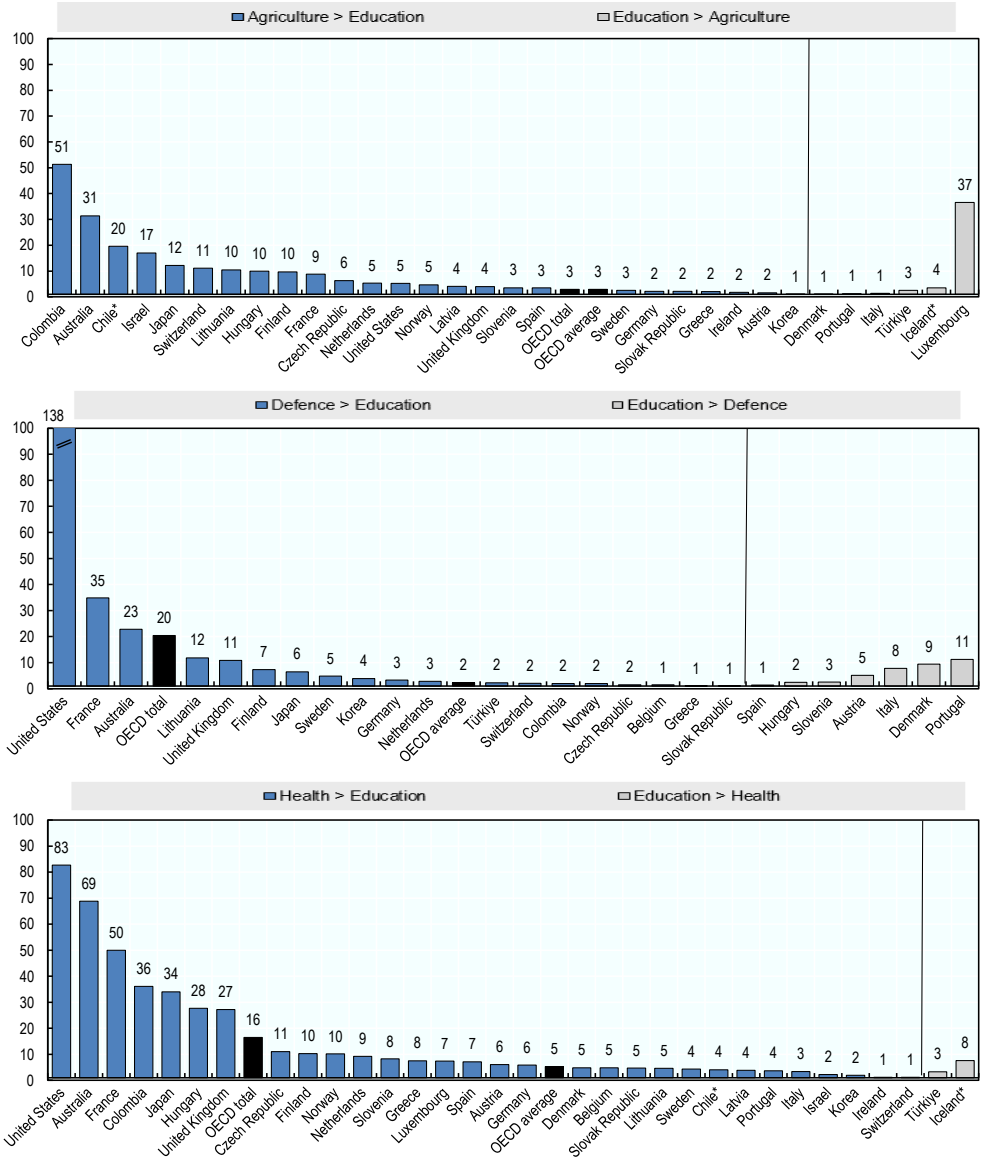
	Agriculture	Culture, recreation, religion and mass media	Defence	Education	Energy	Environment	Exploration and exploitation of space	Exploration and exploitation of the Earth	GAK: R&D financed from General University Funds (GUF)	GAK: R&D financed from sources other than GUF	Health	Industrial production and technology	Political and social systems, structures and processes	Transport, telecommunication and other infrastructures
Latvia	14.0%	3.0%		3.5%	2.4%	6.1%		0.3%	8.2%	29.5%	13.5%	8.4%	2.7%	8.4%
Lithuania	6.2%	2.8%	7.0%	0.6%	3.3%	0.3%	0.0%	3.0%	51.6%	11.9%	2.7%	8.1%	2.3%	0.0%
Luxembourg	0.1%	0.1%	0.0%	2.7%	0.2%	2.0%	0.0%	0.0%	34.9%	24.4%	19.7%	11.0%	5.0%	0.1%
Mexico	3.8%	0.3%	0.2%		15.0%	1.2%	0.1%	4.8%	39.1%	16.8%	6.9%	8.4%	3.1%	0.3%
Netherlands	3.6%	0.3%	1.9%	0.7%	2.0%	0.7%	2.9%	0.9%	55.4%	17.6%	6.2%	4.9%	1.5%	1.4%
Norway	7.1%	1.1%	2.9%	1.5%	2.5%	3.1%	2.3%	1.2%	34.0%	13.3%	15.5%	8.9%	4.8%	1.7%
Poland	6.3%	5.8%	3.5%	0.0%	0.9%	1.2%	0.5%	0.8%	46.4%	29.7%	2.3%	0.9%	0.1%	1.5%
Portugal	2.3%	1.6%	0.2%	2.7%	2.1%	4.3%	0.6%	1.3%	56.7%	8.6%	10.0%	5.1%	1.7%	2.7%
Slovak Republic	4.1%	3.4%	2.0%	1.9%	2.2%	2.9%	1.2%	2.0%	43.0%	16.9%	9.0%	7.7%	2.1%	1.5%
Slovenia	5.1%	2.3%	0.6%	1.5%	4.3%	5.3%	0.2%	2.8%	0.3%	47.3%	12.1%	12.1%	3.1%	3.0%
Spain	6.8%	1.0%	1.4%	2.0%	2.6%	3.1%	5.9%	2.4%	32.9%	14.8%	14.0%	9.3%	1.2%	2.6%
Sweden	1.3%	0.2%	2.5%	0.5%	4.5%	1.8%	1.1%	1.2%	50.6%	22.6%	2.3%	4.3%	2.5%	4.6%
Switzerland	2.2%	0.0%	0.4%	0.2%	0.6%	0.4%	2.6%	0.2%	61.2%	26.6%	0.2%	2.9%	2.4%	0.1%
Türkiye	2.3%	0.0%	13.4%	5.9%	1.3%	0.8%	1.3%	1.4%	48.8%	5.7%	1.8%	10.2%	0.4%	6.7%
United Kingdom	3.1%	1.3%	8.4%	0.8%	4.3%	1.8%	1.4%	3.9%	23.4%	13.3%	21.2%	6.0%	3.2%	7.9%
United States	1.8%	0.0%	47.1%	0.3%	2.7%	0.3%	8.4%	1.0%	NA	8.0%	28.3%	0.5%	0.4%	1.1%
OECD average	5.1%	1.3%	4.0%	1.7%	3.1%	2.6%	2.6%	2.3%	31.0%	20.3%	9.3%	12.0%	2.3%	2.5%
OECD total	*2.8%*	*0.5%*	*19.7%*	*1.0%*	*4.0%*	*1.7%*	*5.8%*	*1.4%*	*17.8%*	*13.1%*	*15.9%*	*12.1%*	*1.1%*	*3.2%*

Note: * 2019 instead of 2020. GAK = General Advancement of Knowledge.

Read: 0.3% of Australia's public R&D budget was allocated to education in 2020, 8.5% to agriculture, etc. The OECD average represents the share of a country's public research budget allocated on average to a specific economic objective. The OECD total presents the share that the OECD area allocates to each socio-economic objective (regardless of where the budget is located).

Figure 8.7. Public R&D budget for agriculture, defence and health relative to education, 2020

Positive or negative factor between the public research budget allocated to education within countries and the OECD



Note: Read: On average, in 2020, an OECD country allocated 3 times more governmental R&D budget to agriculture than education; 2 times more to defence; and 5 times more to health (OECD average). In the OECD area, public R&D for agriculture, defence and health represented 3, 16 and 20 fold the budget of public R&D about education (OECD total).

StatLink https://stat.link/wt93kz

The aforementioned categories of socio-economic objectives constitute a breakdown of applied or earmarked research only. Government appropriations and outlays are also assigned to non-earmarked research under the categories of General Advancement of Knowledge (GAK). This budget represents 51% on average of the public R&D budget, over 80% in Estonia and Switzerland and over 70% in the Netherlands, Poland and Sweden (Table 8.1).

In most countries, a significant share of this non-earmarked R&D corresponds to the share of public funding that governments allocate to universities through "general university funds". In most countries, these "general university funds" come as part of the public funding of universities (and/or academics). In a few countries such as the United States, Colombia or Korea, the public budget allocations for universities is deemed to be used exclusively for the education mission of universities, and research is funded separately. This is why this category appears as "not applicable" in Table 8.1.

Typically, universities (and other research agencies working on basic or multi-objective research) will perform educational research as part of the general advancement of knowledge (as well as research and development on the other socio-economic objectives). While it is reasonable to presume that at least some funding allocated to the general advancement of knowledge is devoted to educational research, further break down of this category is not collected by socio-economic objectives – although some countries collect a breakdown by field of science.

Assuming that the public budget for R&D for the general advancement of knowledge follows the same priorities as the other sectors, one could provide an estimation of those allocations taking these large public R&D budgets into account. In that hypothetical case, countries would allocate 4% on average of their public R&D budget to education (rather than the 1.7% with no such assumption) – and the OECD area, 1.4% of its public research budget (instead of 1%). The message would not be so different: education would remain the second least funded socio-economic objective on average and in total, and in eight countries educational R&D would remain the least funded socio-economic objective, and in 22 countries one of the three least funded.

This is an important caveat of the public R&D budget data by socio-economic objective, and thus to estimate public investment in educational research and experimental development.

Other educational R&D indicators

This section presents briefly other data that used to be collected by countries' statistical offices. Their collection at the international level has been discontinued, but they may still be available at the country level in some countries. The two other categories relate to countries' gross expenditure on R&D, which used to be reported by socio-economic objective, and the research personnel.

Gross Expenditure on R&D

The Gross Expenditure on R&D (also referred to as GERD) is collected by means of especially designed surveys targeted at performers of research and development. The institutions performing R&D are classified according to their main sector, that is, business enterprise, government, higher education or private non-profit. This information is still published by the OECD every year. Its advantage compared to the public budget is that it tries to capture actual rather than planned expenditures and covers other sectors than the government one. It is thus a strong measure of actual performance of R&D and an indicator of who performs it (regardless of the source of funding).

Until 2016, R&D expenditures information on educational expenditures were available by socio-economic objective, including education, in a few countries. (The difficulty to collect the information in enough countries for all socio-economic objectives led to the gradual abandonment of this data collection at the international level).

Table 8.2 presents the latest available distribution of the gross domestic expenditures on R&D by socio-economic objective (for 2014). It covers virtually all sectors of performance for the selected countries. The expenditures on education amounted to 3.2% on average in the OECD countries that collected this information. With the absence of the United States and several other large European countries, the average

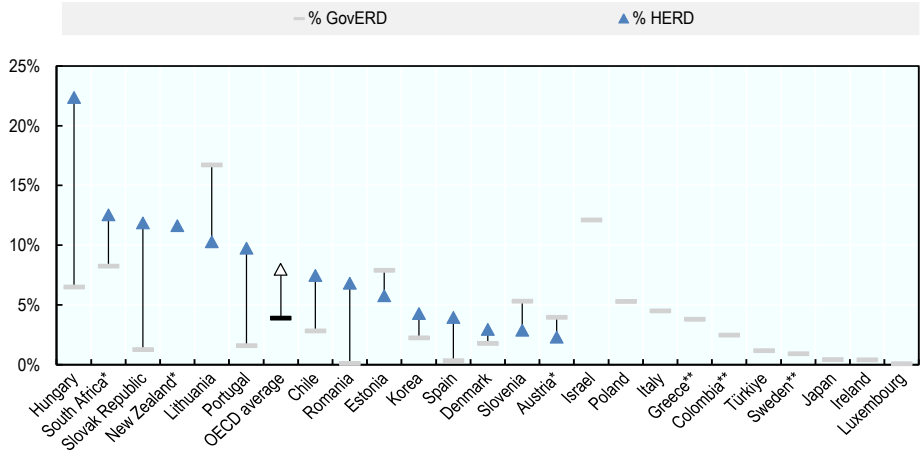
share of expenditure on defence or the exploration of space become relatively small. But once this is taken into account, expenditures on educational R&D appeared as small.

As the information about business expenditures and the non-profit sectors' expenditures on education were often missing, we focus on the two sectors for which information used to be available: gross expenditures on R&D by the higher education (HERD) and government (GovERD) sectors. It should be noted that this indicator cannot be compared in a straightforward way with the public R&D budget (GBARD). The public budget could indeed be spent by any sector in principle, here both the government and higher education sectors.

Figure 8.8 presents the share of intramural expenditure on R&D in education by government and higher education in 2014, the latest year for which enough information in education. On average, a country spent 3.9% of educational R&D in the government sector and 8% in higher education. In countries for which both indicators were available, countries used to spend a greater share of their R&D expenditures on education in higher education than in the government (except in Austria, Estonia, Lithuania and Slovenia). Hungary had the largest share of education R&D in higher education (22%), almost twice as much as any other country. It is likely that higher education institutions still spend (perform) more educational R&D than the government sector.

Figure 8.8. Share of education in total government and higher education R&D expenditures (2014)

Intramural expenditure on R&D in education by government (GovERD) and higher education (HERD)



Note: * 2013 instead of 2014 for Austria, New Zealand and South Africa; ** 2015 instead of 2014 for Colombia, Greece and Sweden
Source: OECD MSTI

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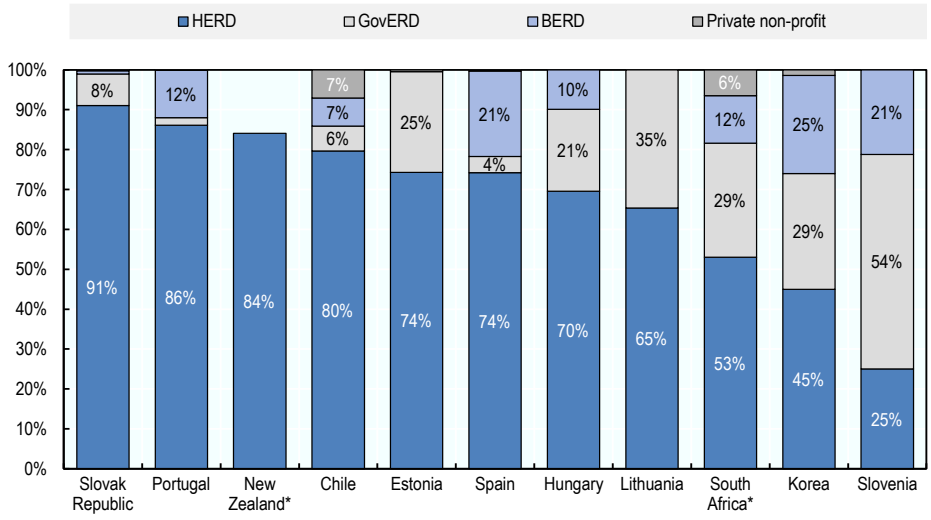
Table 8.2 Percentage of total Gross Domestic Expenditures on R&D by socio-economic objective, 2014

Gross Domestic Expenditures

	Agriculture	Culture, recreation, religion and mass media	Defence	Education	Energy	Environment	Exploration and exploitation of space	Exploration and exploitation of the Earth	General advancement of knowledge	Health	Industrial production and technology	Political and social systems, structures and processes	Transport, telecommunication and other infrastructures
Chile	13.3%	0.5%	0.3%	3.6%	2.7%	6.6%	13.0%	8.8%	20.5%	8.4%	17.1%	3.1%	2.1%
Estonia	5.0%	3.0%	0.8%	3.4%	5.9%	4.1%	0.8%	0.5%	30.4%	8.3%	13.2%	8.1%	16.6%
Hungary	6.9%	1.0%	0.4%	4.4%	1.7%	2.3%	0.2%	1.3%	6.4%	20.9%	40.5%	2.1%	11.9%
Korea	2.3%	1.2%	3.8%	0.9%	6.2%	3.1%	0.9%	1.0%	2.4%	6.6%	62.9%	1.1%	7.7%
New Zealand*	15.2%	7.2%	1.6%	4.2%	4.2%	10.4%		1.4%	7.2%	11.2%	18.7%	2.6%	16.1%
Portugal	4.1%	2.4%	0.8%	5.2%	4.6%	5.3%	1.0%	1.8%	15.7%	16.9%	25.9%	3.5%	12.8%
Slovak Republic	5.7%	1.4%	0.4%	4.5%	1.9%	2.0%	0.5%	4.6%	36.1%	8.0%	27.1%	0.6%	7.1%
Slovenia	1.8%	0.3%	0.0%	1.2%	5.0%	2.6%	0.1%	1.0%	25.4%	11.3%	45.7%	0.5%	4.9%
Spain	5.7%	2.2%	2.6%	1.5%	6.3%	4.6%	2.4%	3.6%	9.8%	19.7%	24.6%	2.7%	14.3%
OECD average	6.6%	2.1%	1.2%	3.2%	4.3%	4.6%	2.4%	2.7%	17.1%	12.3%	30.5%	2.7%	10.4%
South Africa*	9.9%		5.4%	6.7%	3.3%	3.4%	0.4%	9.2%	18.2%	11.1%	26.3%		6.1%

A few countries had a more comprehensive picture of the sectors that perform educational R&D. Figure 8.9 shows that, in 2014, in all countries for which data were available except Slovenia, higher education was the largest performing sector of educational R&D (as measured by expenditures) – and often the sector that spent the large majority of the country's expenditure on educational R&D. Korea (45%) and Slovenia (25%) were the only countries where the higher education sector spent less than 50% of the total education expenditures. This might explain why Korea had such a large government appropriation for educational R&D. The educational R&D expenditures coming from business (BERD) were very limited compared to most other sectors, never achieving 25% of all expenditures. Only Korea (25%), Spain (21%) and Slovenia (21%) reach at least 20%. It would be interesting to know whether this has changed with the emergence of the "education technology" sector.

Figure 8.9. Distribution of the gross expenditures on educational R&D by sector (2014)



Note: * 2013 instead of 2014 for New Zealand and South Africa. HERD = Higher Education expenditures on R&D, GovERT = Government expenditures on R&D; BERD = Business expenditures on R&D.
Source: OECD MSTI

StatLink https://stat.link/mques9

R&D personnel

The R&D personnel working on educational research is the last indicator that could allow one to compare the relative importance of educational research across sectors and countries. Data on R&D personnel are collected by means of especially designed surveys targeted at performers of research and development. Like the domestic expenditures on R&D data, they are collected for different sectors of the economy (government, higher education, business and private non-profit) and can be broken down by field of science. Education is a sub-field of "social science", but reporting at that level of detail has also been discontinued.

According to the Frascati manual (OECD, 2015[7]), data on personnel should ideally include all occupations levels (administrators, researchers, technical and support staff) and internal as well as external personnel. They should also be reduced to full time equivalent (FTE) units. While personnel data were generally available at this desired level of detail, human resources devoted specifically to education research were only listed as headcount of researchers.

Table 8.3. Percentage of government and higher education researchers (headcount) by field of science, 2013

	Social sciences			Social sciences: Education			Agricultural Sciences			Engineering and technology			Humanities			Medical and Health sciences			Natural Sciences		
	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE
Austria	30.1	19.3	20.3	5.5	3.2	3.4	11.4	2.9	3.7	6.9	18.5	17.4	24.5	12.4	13.6	6.6	20.4	19.1	20.7	26.5	25.9
Belgium	3.2	17.8	16.2			2.9	12.0	6.9	7.5	38.4	17.9	20.2	8.6	10.6	10.4	5.3	23.0	21.0	32.5	23.7	24.7
Czech Republic	5.9	20.0	16.2			2.9	5.2	7.2	6.7	8.2	23.8	19.6	15.0	8.2	10.1	8.1	20.7	17.3	57.6	20.0	30.1
Denmark	19.7	20.2	20.2			3.7	0.0	4.9	4.5	1.2	14.5	13.5	24.2	8.7	9.9	41.3	35.8	36.2	13.6	16.0	15.8
Estonia	6.9	19.7	17.9			3.2	8.8	5.0	5.5	3.9	16.9	15.1	36.7	16.0	18.8	18.7	8.9	10.2	25.0	33.6	32.4
Finland	16.8	25.3	23.4			4.2	14.7	3.2	5.8	37.2	17.7	22.0	3.7	11.9	10.1	14.1	18.2	17.3	13.6	23.7	21.5
Germany	6.7	14.6	13.0			2.4	4.3	2.9	3.2	25.4	17.7	19.2	8.1	17.9	15.9	8.9	22.6	19.8	46.6	24.3	28.8
Greece	4.2	21.3	18.2			3.3	4.0	4.4	4.4	17.9	28.2	26.4	35.5	15.9	19.5	19.4	13.6	14.7	19.0	16.4	16.9
Hungary	10.7	23.8	20.3	0.6	3.8	2.9	10.6	5.2	6.6	7.7	14.4	12.6	19.3	16.1	17.0	12.0	17.1	15.7	39.7	23.4	27.8
Iceland	6.3	24.3	22.5			4.1	0.0	4.2	3.8	9.5	6.9	7.2	9.9	14.6	14.1	0.0	35.5	31.8	74.3	14.5	20.7
Ireland	17.2	25.7	25.4		3.1	2.9	52.9	2.0	4.2	10.3	17.9	17.6	0.0	10.4	9.9	5.4	19.6	18.9	14.1	24.4	23.9
Italy	8.0	22.1	18.4			3.3	8.4	3.7	4.9	15.9	14.6	14.9	2.1	15.0	11.6	35.2	18.8	23.1	30.4	25.9	27.1
Japan	2.0	17.8	16.1		4.4	4.0	30.8	4.2	7.0	26.8	15.5	16.7	1.4	10.2	9.3	11.7	37.5	34.7	22.7	10.7	11.9
Korea	16.1	16.2	16.2	1.6	3.4	3.0	8.9	4.6	5.5	50.7	34.2	37.7	1.3	11.1	9.0	4.2	19.2	16.0	18.9	14.6	15.5
Luxembourg	30.7	32.9	31.8			5.8	2.3	0.0	1.1	22.8	6.0	14.2	1.8	11.2	6.6	2.8	9.8	6.4	39.6	40.1	39.9
Netherlands	15.2	20.2	18.6			3.4	11.9	4.8	7.0	18.0	17.8	17.9	3.8	9.8	7.9	24.3	31.9	29.5	26.8	15.5	19.1
Norway	20.8	28.0	26.4			4.8	12.6	1.3	3.8	11.7	11.7	11.7	10.7	13.8	13.1	25.9	31.6	30.3	18.4	13.6	14.7
Poland	5.6	24.7	21.2			3.8		5.7		35.0	20.2	22.9	7.4	17.3	15.5		16.5		26.5	15.6	17.6
Portugal	5.9	24.2	22.8	0.2	4.6	4.3	4.9	2.6	2.8	10.1	19.2	18.6	2.4	17.7	16.6	65.3	14.8	18.4	11.4	21.5	20.8
Slovak Republic	12.6	25.2	23.2		6.4	5.4	5.9	4.4	4.6	12.2	28.8	26.2	18.1	14.8	15.3	9.0	14.5	13.6	42.1	12.4	17.1

	Social sciences			Social sciences: Education			Agricultural Sciences			Engineering and technology			Humanities			Medical and Health sciences			Natural Sciences		
	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE	Government	Higher Education	Gov + HE
Slovenia	12.5	17.3	15.7			2.8	5.3	6.0	5.7	2.9	24.7	17.4	13.2	8.5	10.0	16.2	30.8	25.9	50.0	12.8	25.3
Spain	4.1	25.8	21.3			3.9	9.9	2.4	4.0	13.8	21.4	19.8	3.2	14.5	12.2	51.9	17.1	24.3	17.0	18.8	18.5
Sweden	11.5	24.1	22.3			4.0	0.1	2.4	2.1	9.0	15.2	14.3	3.2	12.2	10.9	57.9	23.8	28.7	18.4	22.3	21.7
Türkiye	4.0	26.4	25.1			4.5	32.6	3.9	5.6	32.9	17.8	18.7	0.5	13.0	12.3	3.7	30.8	29.2	26.3	8.1	9.1
United Kingdom	11.2	17.6	17.5			3.2	12.8	1.2	1.5	16.3	17.8	17.8	3.8	20.5	20.0	14.2	23.1	22.8	41.6	19.8	20.4
OECD average	11.5	22.2	20.4	2.0	4.1	3.7	11.3	3.8	4.6	17.8	18.4	18.4	10.3	13.3	12.8	19.2	22.2	21.9	29.9	19.9	21.9

Note: In Austria, in 2013, 5.5% of researchers involved in educational R&D performed for the government and 3.2% for the higher education sector; together they account for 3.4% of total researchers in both sectors.
Source: Calculations based on OECD MSTI data.

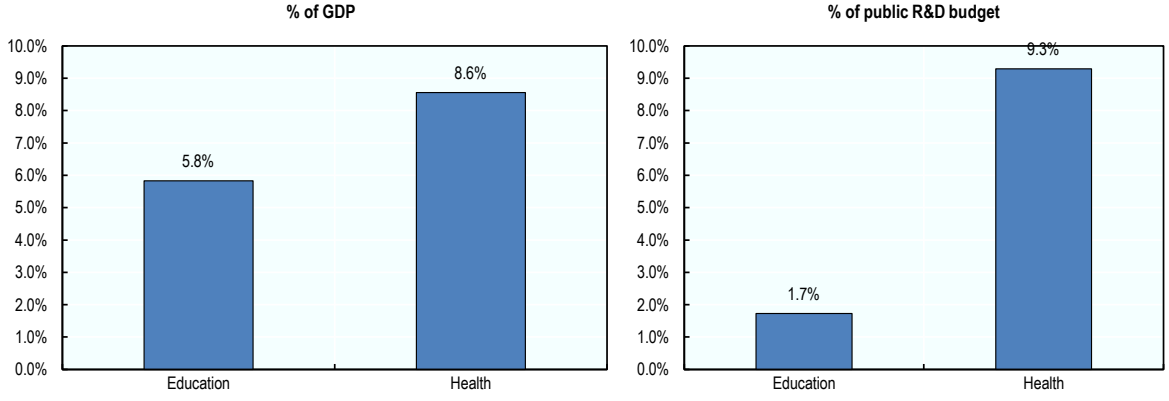
Table 8.3 presents the percentage of researchers (headcount) engaged in R&D by sector of performance and by field of science in 2013. Human resources in R&D were mainly concentrated in STEM disciplines: on average, 47.6% of all government researchers worked in engineering and natural sciences, and 38.3% of higher education institutions researchers. Social sciences appeared as the third most prominent field of science in terms of researchers (20.4%) considering government and higher education sectors together, at par with medical sciences (21.9%). Researchers involved in humanities represented 12.8% of researchers employed in both sectors and agriculture only 4.6%.

Data on researchers engaged in educational R&D was available for only 7 out of 25 countries. Higher education personnel exceeding the government personnel in three countries over four where full data are available. For these seven countries, the average percentage of all R&D personnel working on educational research (considering both sectors) stood at 3.7%.

Summary and conclusions

The R&D indicators presented in this chapter suggest a small public investment in educational research and experimental development. The public budget allocated to educational R&D is the second smallest of all areas of applied research, with an average budget allocation of 1.7% of all public R&D budget in 2020 within a country, that is, USD 24 per student. Figure 8.10 shows that on average an OECD country spends 1.5 as much of its GDP for health than education, but that it allocates 5.5. as much of its public R&D budget to health than to education.

Figure 8.10. Average share of GDP (2019) and public R&D budget (2020) for education and health in an OECD country



StatLink https://stat.link/7rxfsc

While no recent data are available, the share of all expenditures on educational R&D in the government and higher education sectors was also relatively small in 2014, at an estimated 3.2% of all R&D expenditures, and the percentage of R&D personnel for educational R&D was estimated at 3.7% in the few countries for which information was available. Those older data suggested that in most countries educational R&D was overwhelmingly performed by the higher education sector.

What is the “appropriate” level of public educational R&D? Difficult to say. There are many reasons why educational R&D could be less funded than other sectors. Some have argued that, like humanities or some branches of mathematics, it is less capital intensive. Perhaps these arguments have become less relevant as expensive research strategies such as randomised control trials, experimental research, large scale

surveys and other forms of data collections have gained ground. Debates about the value of public investment in educational research and just the role in educational improvement remain vibrant (OECD, 2000[9]; OECD, 2007[10]; OECD, 2022[3]). Sceptics argue that the quality of educational research does not warrant more public investment, to which others counterargue that it is precisely the lack of public investment that prevents a leap in its quality (Bransford et al., 2009[11]).

The main contribution of this chapter to this discussion is that it will be very difficult to reach a conclusion before we get reliable indicators about the amount spent on educational R&D within countries, so that we can research whether they are linked to educational performance, pace of improvement, whether this depends on the type of research, on the level of research, or other considerations.

As of 2023, governments have limited measures of their expenditures and performance of educational R&D. The best available indicator as of 2023 lies in the public budget for educational R&D (education GBARD). All other indicators have been discontinued at the international level (although some countries still collect them). This information would indeed be easier to collect than educational R&D performed in the business enterprise sector.

Current data on governments' public budgets for educational R&D have two main limitations, even though they are very high-quality data collected by countries' statistical offices according to internationally agreed standards.

First, the public budget allocated to research and development does not necessarily equal countries' actual expenditures on research and development. This may come from discrepancies between the planned and the actual budgets, but also from the fact that some of the public budget devoted to research and development may sometimes be spent on other activities. Collecting actual expenditures on research and development is thus another way to capture the public investment in research and development.

Second, the indicator is limited to "earmarked" or "applied" R&D. In practice, the collection seems too often cover the budget of public education agencies that are outside the higher education sector. Educational research that takes place in higher education tends to be included in general advancement of knowledge. As we know that most expenditures and researchers are located in the higher education sector rather than the government sector, the current impossibility to break down the "general advancement of knowledge" by socio-economic objective makes it possible that the significant percentage of public budget allocated to universities hides very different allocations to educational research across countries – even though it is unlikely that that more than a very small share of general university funds are allotted to educational research given existing information. The real issue may lie in the fact that the data reflect countries' institutional structure rather than the full reality.

Finally, as good as they are, they may remain too generic to guide education policy makers in their educational R&D planning. Additional information about the performance of educational research by different sectors, its sources of funding, the distribution of research performed by research method, level of education, area of education, and the share of research and experimental development are for example beyond the scope of current data collections on R&D.

However, countries could adopt two different strategies if they wanted to have an informed educational R&D policy: improve existing indicators or implement a specific national or international survey on educational R&D.

Given the currently collected data, the most straightforward approach would be to improve the comparability of the government budget for R&D by socio-economic objective (GBARD). Most of the improvement work should be about unpacking the categories of "general advancement of science" and notably the "general university funds" so they can be ascribed to educational R&D and other socio-economic objectives such as education (and the other ones). One simple way would be to evaluate the weight of educational research within the higher education sector (or the higher education research output on education). The main value of this indicator is to provide a reliable budget for educational R&D and to

allow for comparisons with other sectors. This could probably be estimated without an actual survey. Countries could also reactivate the data collections of the gross expenditures on R&D by socio-economic objective and collect research personnel data by both socio-economic objective and sub-fields of science.

As it is usually difficult to reliably collect information at a granular level (by socio-economic objective or by sub-field of science), especially when all objectives and fields of science are targeted, another possibility would be for education ministries and their statistical agencies to collect themselves relevant information about the expenditure, funding, performance and topics covered by educational R&D in their country. Chapter 9 of this publication suggests survey tools and techniques that would allow to do it in a targeted way, and thus without being too resource-intensive (Vincent-Lancrin, 2023[12]). Some countries such as Norway already carry out this type of survey.

References

Bransford, J. et al. (2009), *The Role of Resesarch in Educational improvement*, Harvard Education Press. [11]

McKenzie, P. (2007), *Measuring the Resources Allocated to Educational Research and Development in OECD Countries*. [6]

OECD (2023), *OECD Science, Technology and Innovation Outlook 2023: Enabling Transitions in Times of Disruption*, OECD Publishing, Paris, https://doi.org/10.1787/0b55736e-en. [2]

OECD (2022), *Who Cares about Using Education Research in Policy and Practice?: Strengthening Research Engagement*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/d7ff793d-en. [3]

OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-en. [7]

OECD (2015), *The Innovation Imperative in the Public Sector: Setting an Agenda for Action*, OECD Publishing, Paris, https://doi.org/10.1787/9789264236561-en. [13]

OECD (2015), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, https://doi.org/10.1787/9789264239814-en. [1]

OECD (2007), *Evidence in Education: Linking Research and Policy*, OECD Publishing, Paris, https://doi.org/10.1787/9789264033672-en. [4]

OECD (2007), *Revised Field of Science and Technology (FoS) Classification in The Frascati Manual*, http://www.oecd.org/science/innovationinsciencetechnologyandindustry/38235147.pdf. [10]

OECD (2002), *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development*, The Measurement of Scientific and Technological Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264199040-en. [8]

OECD (2000), *Knowledge Management in the Learning Society*, OECD Publishing, Paris, https://doi.org/10.1787/9789264181045-en. [9]

OECD (1995), *Education at a Glance – OECD Indicators*, OECD Publishing. [5]

Vincent-Lancrin, S. (2023), *A survey on educational R&D: a proposed international standard for questionnaire and methodology*, OECD Publishing. [12]

9 A survey on educational R&D: a proposed international standard for questionnaire and methodology

Stéphan Vincent-Lancrin, OECD[4]

Countries routinely collect information about their investment and operation in research and development, a key indicator of countries' ability to innovate. Adapting the cross-sectorial approach promoted by the Frascati Manual, this chapter presents a survey instrument (questionnaire) and method to collect information about countries' educational research and development. The questionnaire, presented in Annex, can be used (and adapted) by jurisdictions interested in knowing how much is spend on educational research and development, by whom, and on what broad topics.

[4] This work has benefited from the inputs of many former OECD colleagues, notably Francisco Martinez as an intern, Richard Scott and Nicolas Jonas, as well as from country delegates.

Introduction

Most governments collect some statistics about their investment in educational research and development (R&D) as part of their general statistics on R&D, which allow to compare their spending for educational research and for other socio-economic objectives. Education policy makers interested in driving their educational research agenda would need more granular and accurate information to better understand who performs and funds educational research within their system, and whether educational R&D focuses on their policy priorities.

Given limited budgets for educational R&D, governments need to invest them in a smart way and steer the system based on a better understanding of the educational R&D that is already performed or funded. For example, is enough knowledge generated to improve the quality of tertiary education and early childhood education compared to primary and secondary education? Is there enough educational research on teaching and learning to support practices in the classroom? Depending on what foundations and the higher education sector already fund or work on, what would it be more strategic or useful for governments to support? In the current state of affair, most education ministries and research agencies have very little information to take informed decisions. Therefore collecting specific information that can guide their decisions and inform them on how much their system in the generation and application of new knowledge is important.

This chapter proposes an exemplar questionnaire and methodology to collect information about the performance and funding of educational R&D within a country or education system – or internationally. Countries or regions could adapt it to their context or interest, or implement it as it is. Annex 9.A presents the model questionnaire. It follows the guidelines and definitions of the Frascati Manual (OECD, 2002[1]; OECD, 2015[2]), but mainly focuses on the public funding and performance of educational R&D and proposes questions that are customised and specific to the education sector.

The rest of the chapter is organised as follows. After presenting the structure of the questionnaire and explaining some choices made, a suggested method to define the universe of the respondents and collect the data is proposed. Finally, a couple of examples of implementation are briefly presented.

Outline of the questionnaire

The questionnaire focuses on the funding or investment in educational research by collecting information about the performance and the funding of educational research and development, and proposes definitions of what should be counted as performance and as funding to avoid double counting.

After an introduction about the questionnaire, which can be customised by the administering organisation, and contact information about the respondents, section 2 tries to categorise the responding organisation and identify whether if is a funder and/or performer of educational R&D.

Compared to usual R&D questionnaires, the business sector has been left out. This is mainly for practical reasons: the possible units to survey would then be too numerous if those were included, but in principle the questionnaire could also work for for-profit companies performing or funding educational research. In education, most research comes from the higher education sector and the government. In some countries (for example the United States), the private non-profit sector (foundations) plays a large role too, either as a performer or funder of educational research. This is why this is an explicitly included in the scope of the survey. Because of the educational nature of the questionnaire and the fact that most of the answers will be of interest to departments of education, question 4 requires details about the nature of the responding organisation. All the questionnaire focuses on a specific fiscal year (to be specified depending on the date of administration).

The questionnaire is divided in two big sections: performance of educational R&D (section 3) and funding of educational R&D (section 4), with mirroring questions. Question 5 is both a summary and a "skip" question that collects the total amount that the responding organisation spends on performance and funding of educational R&D. The questionnaire is thus relevant for organisations that only perform educational research, only fund educational research or do both.

Section 3 requires details about the performance of educational R&D, using respondents to provide a (rough) percentage of the allocation of their performance between different research topics (question 6), levels of education (question 7), sources of funding (question 8).

The different areas of educational research propose high level categories that build on "special interest groups" as defined or identified by different research associations (e.g. American Educational Research Association (AERA), European Educational Research Association (EERA), European Association for Research on Learning and Instruction (EARLI), etc.). While educational research associations routinely have around 20-30 interest groups, our categories summarised the main themes in six broad umbrella topics (e.g. education "statistics", "teacher education", "learning, instruction and curriculum", plus the possibility to add one's own category). It is indeed unlikely that respondents can provide a very granular answer to this question so framing it according to what could be their main departments seemed more appropriate.

Question 6 asks about the level of education the educational research is about – noting that there might be differences across countries. (For an international survey, countries could use the International Standard Classification of Education (ISCED) classification and translate it into their national categories). Vocational education and training was omitted on the ground that it covers secondary education tertiary education and "adult learning". Relevant categories could be added in a domestic context. When research is valid for all or several levels of education, a response category was provided.

The sources of funding defined in Question 8 take into account the federal nature of some countries (central/local government), the fact that for-profit companies (industry) sometimes fund research and development, the role of foundations and other non-profit organisations, the role of the organisations' own funds, and finally, the role of international (or inter-governmental) organisations such as the European Commission, the World Bank, other banks of regional development, and others.

Questions 9 and 10 try to identify the amount of development in education, which is typically much lower for the target organisations than actual research. Question 9 requests a raw percentage on the divide between research (basic and applied) and development, while question 10 enumerates the typical development outputs an organisation involved in educational R&D could have.

Question 11 provides a shortened adaptation of a "barrier" question that is typical in R&D surveys, limiting the answer options to those most relevant to the education sector. Acknowledging that those answer proposals were mainly designed for the private sector, two open answers are suggested if need be.

Question 12 asks about the headcount and full time equivalent personnel devoted to educational R&D in the responding organisation. In order to make it easier to answer, but also to provide information about whether educational researchers work in "specialised" organisations or not, the question asks for the count for all fields of science, for educational R&D and for personnel that is not devoted to R&D (e.g. administrative or communication staff).

Section 5 asks for the same questions in the frame of the funding rather than performance of educational R&D, using the same sub-categories: sub-areas of R&D (question 13), target level of education (question 14), sector of recipient (rather than source) organisation (question 15), research or development (question 17) and type of development output (question 18).

Question 16 acknowledges that a funding institution of educational R&D could get its funding from different types of organisations. For example, a national research agency may get the funding it allocates to

educational R&D from government appropriations or local appropriations, but also from other sources of funding. It is also common for foundations to pool their resources so that a funding organisation may allocate funds that were received from another non-profit organisation.

Section 6 allows respondents to enter comments to qualify and explain their answers.

Suggested survey methodology

Collecting information about educational research and development is challenging because only a small part of a country's research and development ecosystem invest in or perform educational research and development. Surveying the entire ecosystem for this purpose would be a difficult and expensive exercise, often unrealistic for most countries or jurisdictions and leading to high rates of non-response. Therefore, the suggested methodology is comprised of three phases: the first is to conduct an initial mapping of educational R&D within the jurisdiction (or each country participating if the survey is conducted internationally). The second phase is to use this mapping to collect data on educational R&D from key actors. The third phase is to analyse the questionnaire responses and prepare a report.

Phase 1: Mapping of educational R&D

The main aim of the mapping exercise is to establish the universe for the survey on educational R&D. In the case of an international implementation, this phase also allows to verify that the approaches are consistent across countries and establishing which institutions should be involved in the survey in each country).

The target universe is institutions in the public, higher education and non-profit sectors financing or undertaking educational R&D. Relevant institutions in the mapping will typically include: government departments (not solely those in charge of education), government agencies, universities, public research centres/organisations, foundations, research councils and statistical agencies. The survey is intended to include both performers and funders of educational R&D (with separate questions to minimise any risk of double counting). The private sector and schools are not within the scope of the proposed survey instrument. In the higher education sector, the focus is not solely on education science departments – research on education topics carried out in a range of disciplines such as economics, sociology or medicine is within scope and should be included in the mapping process in principle.

The questionnaire takes into account the diverse activities within educational R&D. Curriculum development and educational evaluation or statistics should therefore be included in the mapping exercise if the results of these exercises are made public. Parts of the public educational inspectorate are also likely to meet the definition.

However, depending on the context, only the main actors with a significant activity in educational R&D should be included

The mapping exercise will typically include the following key actions for countries/jurisdictions:

- Identify the universe of domestic educational research based on the definitions above (the focus of the project should be made explicit to avoid misinterpretation). The priority of the mapping is to identify large performers of educational R&D – an exhaustive census of relevant actors is not expected. Annex 9.B gives some example of the information that countries or jurisdictions could aim to collect about the educational research units for their internal discussions.

- To conduct the mapping, jurisdictions should draw on expert knowledge to help identify where educational R&D takes place. In particular, national associations dealing with educational research or major educational research institutes should be consulted. Countries may benefit from establishing a review group of experts.

- Countries may also wish to draw on bibliometrics to identify relevant institutions.

- Countries should then review the mapping process and output, ideally with external experts not involved in the mapping group in order to introduce a layer of internal checks.

- The mapping phase will allow countries to undertake cognitive testing of the draft questionnaire with national experts. If implemented locally, the questionnaires should be adjusted accordingly. If implemented internationally, feedback should be shared with the international coordinator at this early stage so that a wording that work for all participating countries/jurisdictions can be agreed upon.

Phase 2: Survey of educational R&D practitioners

The model of administration is similar to the one for an innovation survey (see chapter 2 of this report, (Van Lieshout, Arundel and Vincent-Lancrin, 2023[3])).

Depending on the size of the relevant R&D practitioners, they may opt for two strategies: a census of all large R&D performers and funders that they have identified; a stratified random sampling based on characteristics of importance within the concerned jurisdiction.

One of the key challenges in such a survey will be to ensure a reasonable response rate and to minimise selection bias. Establishing contact persons for each institution and conducting questionnaires in-person may assist this process. Another issue may come from how the possible use of the survey information will be perceived by the respondents, and how the confidentiality of the information will be managed. Countries could resort to their official statistical agency, if any, commission a third party that would provide them with the survey data in an aggregated form only to protect anonymity for the participating organisations. They may also consider guaranteeing that the responses will not be used for other purposes than statistical ones. Institutions may also be wary of responding to non-compulsory government surveys; partnering with educational research institutions may be one way to resolve this problem.

The data collection will typically include the following key actions for countries/jurisdictions:

- Once finalised, countries will need to organise translation of the questionnaire into their national language (in the case of an international survey).

- Identify contact persons in key institutions to whom to send the questionnaire (the expert group during the mapping exercise may help with this). For universities, targeting the relevant departments directly will be necessary, though in some countries the institutions would have to be formally notified.

- Consider visiting institutions in-person in order to encourage participation. In many instances, responding to the questionnaire will require collaboration between researchers and administrative or budget officers (e.g. in defining how much expenditure is allocated to R&D).

- Countries also have the option of using fieldwork teams to assist the data collection, or draw on the expertise of the community identified during the mapping. Working collaboratively with relevant educational associations or institutes is advised, as it may change the way the survey is perceived and encourage participation.

- Reach at least a 60% response rate and analyse the non-response to ensure that it can be considered as random.

- Undertake a check of the collected data, highlighting any issues in consistency and comparability.

Phase 3: Report, analysis and discussion

Once the data from the questionnaires are collected, countries should ensure some level of quality assurance of the data collection. The data analysis performed on the aggregated responses will allow for the preparation of a draft report providing comparative information on:

- the amounts spent on educational R&D, presented in absolute terms and in relative terms to account for the size of the country/jurisdiction and its level of public expenditures on education;
- the relative weight of different types of actors in the performance and funding of educational R&D (government, higher education, private non-profit);
- the levels of education and topics of education the most commonly researched and funded in absolute terms and by different types of actors to see whether different actors are inclined to perform or fund different types of research, whether there is a good balance to improve different dimensions of the education process;
- the share of experimental development in the total R&D and what are its typical outputs;
- the level of overlap between funding and performance (are the sectors funding also the sectors that are performing, and do they do so through specialised institutions, within ministries or by other means);
- the composition of human resources of educational R&D.

Ideally, the repetition of the survey at regular intervals will allow to monitor the evolution of this funding and perhaps will allow for zeroing in on specific topics from one edition to the next.

Two examples of successful implementation

A pilot implementation of the questionnaire was proposed to OECD countries in 2013-15. Three countries/education systems participated. One succeeded in doing the mapping and implemented the data collection, but failed to engage one of the larger educational research performers, a non-response that made the other collected results impossible to redress or interpret with enough accuracy. Two other countries successfully implemented the methodology and the data collection: the Netherlands (de Jonge, 2016[4]) and Norway (Gunnes and Rørstad, 2015[5]).

Norway has carried out surveys of educational R&D since 2007, so the mapping to identify the relevant units to survey for the data collection was straightforward. Adjustments consisted mainly in mapping Norwegian response categories to the ones provided by the OECD questionnaire (for example go from the “Institutes”, which includes a few private research institutes, to the “Government” category) and in adding some questions. Gunnes and Rørstad (2015[5]) present the implementation of the OECD survey. Since their 2013 survey, Norway has replicated the OECD questions in its subsequent surveys of educational R&D (Rørstad et al., 2021[6]; Rørstad et al., 2019[7]; Gunnes, Hovdhaugen and Olsen, 2017[8]) .

The Netherlands also successfully implemented the proposed approach in 2015, in their case with no prior survey infrastructure. De Jonge (2016[4]) summarises the main findings as follows:

“The most important finding is that investment in educational R&D is limited in terms of both budget appropriations and number of individuals working in this field. Approximately 150 institutions in the Netherlands are involved in educational R&D. They employ almost 1000 FTEs [full time equivalents] in research, with a further 175 FTEs providing research support. According to our calculations, the Netherlands invests a total of approximately EUR 120 million per annum in educational R&D. If we

compare these figures to total employment in education or to total expenditure on education, we see that spending on educational R&D is limited. Expressed as a percentage, it comes to 0.28%. That is relatively little compared with the almost 2% spent on R&D nationally (across all sectors). Our conclusion is that education is a research-extensive sector in which investment in education itself has very little grounding in research and development work evaluating the effectiveness and efficiency of that investment."

Both examples show that the methodology and standards could easily be used internationally once a political will emerges within OECD countries.

References

de Jonge, J. (2016), *Onderwijsonderzoek in Nederland - Inventarisatie voor de OECD*, Rathenau Instituut. [4]

Gunnes, H., E. Hovdhaugen and B. Olsen (2017), *Utdanningsforskning i Norge 2015: Ressurser og resultater*, http://hdl.handle.net/11250/2442190. [8]

Gunnes, H. and K. Rørstad (2015), *Educational R&D in Norway 2013: Resources and Results*, http://hdl.handle.net/11250/2412424. [5]

OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-en. [2]

OECD (2002), *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development*, The Measurement of Scientific and Technological Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264199040-en. [1]

Rørstad, K., B. Sarpebakken, K. Wendt, H. Gunnes, B. Magne Olsen and M. Østby (2019), *Ressursinnsatsen til FoU innenfor tematiske områder i 2017*, http://hdl.handle.net/11250/2619010. [7]

Rørstad, K., B. Sarpebakken, K. Wendt, M. Nedberg Østby, H. Gunnes, E. Denisova and F. Sæbø Steine (2021), *Ressursinnsatsen til FoU innenfor tema- og teknologiområder i 2019*, https://hdl.handle.net/11250/2771665. [6]

Van Lieshout, K., A. Arundel and S. Vincent-Lancrin (2023), "Measuring Innovation through Surveys: Main Considerations and Applications to Education", in Vincent-Lancrin, S. (ed.), *Measuring Innovation in Education 2023: Tools and Methods for Data-Driven Action and Improvement*, OECD Publishing. [3]

Annex 9.A. OECD questionnaire on educational research and development

Innovation and improvement in education partly relies on educational research and experimental development. The [*name of surveying organisation*] seek to improve the quality of data on educational research and development by undertaking a new data collection following internationally comparable categories. The answers collected through this survey are intended to be used for drafting reports and papers produced by the [*name of surveying organisation*] and not be used for any other purposes. The questionnaire has been developed by the OECD Centre for Educational Research and Innovation (CERI), mainly for an international implementation allowing for comparative information. *[If relevant: It has been adapted by <name of the surveying organisation>.]*

Definition

Research and experimental development (R&D) is defined as "creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge".

Research by students at the PhD level carried out at universities should be counted, whenever possible, as a part of R&D. However, all education and training of personnel in universities and special institutions of higher and post-secondary education should be excluded.

Guidelines and scope

The questionnaire follows the methodological guidelines of the Frascati Manual. Most terms used in the questionnaire are clarified in the Frascati Manual.

This survey collects data on educational research and experimental development performed by organisations from the government, higher education and non-profit sectors in OECD countries.

The person responsible for completing this survey should be an individual or officer who leads or supervises R&D undertaken in the organisation. Complete responses are essential to support a comprehensive collection of key elements of educational research. Please answer all questions. Where exact data are not available, please provide an estimate and indicate it in section 5.

The questionnaire is structured as follows:

Section 1: Contact information

Section 2: Organisation information

Section 3: Performance of Educational R&D (for organisations performing R&D)

Section 4: Funding of Educational R&D (for organisations funding R&D)

Section 5: Additional information

For further assistance in interpreting the questions contained in the survey or for any related questions, please contact:

Ms/Mr xxxxxxxxxxxxxxx Ms/Mr xxxxxxxxxxxxxxxx

Section 1: Contact Information

Primary Contact (person who is responsible for the institution's survey answers)

Full name _____

Position _____

E-mail address _____

Telephone number _____

Fax number _____

Alternate Contact (person to contact if the primary contact is unavailable)

Full name _____

Position _____

E-mail address _____

Telephone number _____

Fax number _____

Section 2: Organisation Information

1. **Name of organisation / unit** _____

2. **Name of parent organisation** _____

3. **Country** _____

4. **In which sector of the economy would you classify your organisation?** *(please tick one answer)*

☐ Higher Education

This sector includes all universities, colleges, and other institutions of post-secondary education. It also includes all research institutes, experimental stations and clinics operating under the control of, administered by or associated with higher education institutions.

☐ Government

This sector includes all bodies, departments and establishments of government at all levels – central, state or provincial, district or municipal. It includes non private institutions controlled and mainly financed by government, but not administered by the higher education sector.

☐ Private non-profit

This sector includes non-market, private non-profit institutions serving the general public, other than those mainly financed by government or providing higher education services or administered by higher education institutions

Please give additional details of your main activity (and only tick one box corresponding to the sector selected in your previous answer)**.**

Higher Education	Government	Private non-profit
☐ University	☐ Central	☐ Foundation
☐ College	☐ Regional (state)	☐ Non-governmental organisation
☐ Research institution	☐ Local (district, city, etc.)	☐ Other *(please specify)*
☐ Clinic	☐ Other *(please specify)*	
☐ Other *(please specify)*		

_____

5. **During fiscal year <20xx>, how much of your organisation's expenditures were allocated to perform and fund educational R&D?** *(please write down the amounts in your national currency)*

Educational R&D consists of a broad range of activities, including but not limited to research and experimental development on: educational policies; management, organisations and leadership; curriculum studies; learning; instructional methods; teaching and

teacher education; assessment and evaluation; education statistics; and educational technology. Please consider also all other activities not listed here which you regard as educational R&D. All education and training of personnel in universities and special institutions of higher and post-secondary education should be excluded. However, research by students at the PhD level carried out at universities should be counted, whenever possible, as a part of R&D.

All your R&D expenditures should fall in either performance or funding of R&D. Please ensure you do not count any expenditure twice. Educational R&D can be performed with your own funds or other funds, and includes sub-contracted research. If your organisation has been sub-contracted to carry out educational R&D that belongs to another organisation, it should NOT be included.

Copyright is not the only criterion of belonging. If your organisation or its members have performed some research that will be published in a scientific journal or by a publisher that will own the copyright of your work, please report this research as a performer. If your organisation or its members perform research for another agency, for example a statistical agency, which will publish the work under its corporate name, please do NOT report it as performed by your organisation, even if you are acknowledged as author: the commissioning agency will report it in its performance of research (and consider your contribution as sub-contracted and thus part of its performance budget). If you produce by-products of commissioned work for scientific journals, commercial publishers, etc., they should be reported as performed educational R&D.

Funding only concerns research grants and awards, and not commissioned research as part of your own research. Research grants may be given through all sorts of mechanisms and can be given for specific areas of research, specific types of research, or with full freedom in topics and methods to researchers.

	Amount (National Currency)
Perform educational R&D *R&D is considered performed by your organisation if its outputs (e.g., publications, patents, product, services) belong to your organisation or the researchers of your organisation.* *Include current costs (both direct and indirect) and capital expenditures (report in full when purchased in fiscal year <20xx>, exclude depreciation provisions).*	
Fund educational R&D *R&D is considered funded by your organisation if its outputs (e.g., publications, patents, product, services) belong to the recipient of the funds. Do not count the same resources twice: amounts in this cell should not contribute to the previous cell.*	

If your organisation <u>did not allocate any expenditures to perform educational R&D</u>, please skip to question 13 (Section 4).

Section 3. Performance of Educational R&D

The questions in this section refer to the educational R&D activities performed by your organisation in fiscal year <20xx>.

6. Specify the percentage of the total educational R&D performed in fiscal year <20xx> by sub-area of educational R&D.

If the R&D activities performed by your institution belong to several of the categories below, please allocate them proportionately to the amount spent on the different sub-areas in your research. Should this be too difficult to estimate, please allocate the percentage evenly between the sub-areas concerned.

Example: a research programme may produce indicators on the management of schools. If the research mainly emphasises the statistical dimension, you may allocate its expenditures as 80% in "education statistics" and 20% in "Management, Organisation, and Leadership". If you do not find a satisfactory allocation, please allocate 50% to each sub-area.

	Percentage
Educational Policy, Politics, and Social Context *Research on educational policy, including political, economic, legal and fiscal issues. Research on relations between educational processes and the social, political, and economic contexts in which they occur. Research on the evaluation of specific educational policies. Educational policy design.*	
Management, Organisation, and Leadership *Research on administration, management and organisation in the education sector, and sources and types of educational leadership, including administrators and other actors inside and outside of schools.*	
Learning, Instruction and Curriculum *Research on learning processes and instruction practices in formal and informal settings, for all age groups. Development of instructional methods based on learning and instruction research. Research on curriculum. Research on education for professions other than teaching (e.g., architecture, engineering, health professions, law).*	
Teacher Education *Research on teaching, on teacher development and education from preservice through professional induction to the in-service stages of teachers' careers.*	
Assessment and Evaluation *Psychometrics and quantitative methods as applied to educational research as well as qualitative and evaluation methods as applied to educational research. Development of assessment tools.*	
Education Statistics and Research Methods *Research aimed at development and consolidation of educational indicators at different levels. Research aimed at improving quantitative and qualitative research methods in education.*	
Other *(please specify)* _____	
Total *(sum of all rows)*	100

7. Specify the percentage of the total educational R&D performed in fiscal year <20xx> about specific levels of education.

If the R&D activities performed by your institution belong to several of the categories below, please allocate them proportionately to the amount spent on the different education levels in your research. Should this be too difficult to estimate, please allocate the percentage evenly between the sub-areas concerned.

	Percentage
Early childhood education	
Primary education	
Secondary education	
Tertiary education	
Adult education and lifelong learning	
Not applicable *R&D that cannot be classified by sector of education*	
Total *(sum of all rows)*	100

8. Specify the percentage of the total educational R&D performed in fiscal year <20xx> by source of funding.

Funds received for R&D performed during earlier periods or for R&D not yet started should be excluded from the sources of funds reported for the specific period. If the funding passes through another organisation, you should report the initial source of funding.

	Percentage
Central government *Include awards and funds for educational R&D (including direct and reimbursed indirect costs) granted by all agencies of the central / federal government.*	
Local government *Include awards and funds for educational R&D (including direct and reimbursed indirect costs) from state, county, municipal, or other local government and their agencies.*	
Industry *Include all awards and funds for educational R&D (including direct and reimbursed indirect costs) from profit-making organizations. Do not include awards from non-profit foundations financed by industry; these should be included under Private non-profit.*	
Private non-profit *Include all awards and funds for educational R&D (including direct and reimbursed costs) from private non-profit institutions, regardless of their source of funding.*	
Own organisation funds *Include all funds (including related indirect costs) that your institution spent for educational R&D activities from the following unrestricted sources: tuition and fees; endowment income; gifts; and other funds generated by the institution.*	
International funds *Include all funds from the EU, international organisations, foreign governments, private non-profit, businesses, including from the same group.*	
Other sources *(please specify)* _____	
Total *(sum of all rows)*	100

9. Specify the percentage of the total educational R&D performed <u>by type of R&D.</u>

	Percentage
Research (Basic and Applied) *Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view* AND *original investigation undertaken in order to acquire new knowledge but directed primarily towards a specific practical aim or objective.*	
Experimental development *Systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.*	
Total *(sum of all rows)*	100

If your organisation did not perform any development activities during fiscal year <20xx>, please skip to question 11 in this section.

10. During fiscal year <20xx>, did your organisation engage in the development of the following products/services, in whole or in part: *(tick as many as applicable)*

- ☐ Curriculum
- ☐ Textbooks and other learning/teaching resources
- ☐ Digital learning resources using advanced technology (e.g. intelligent tutoring systems, etc.)
- ☐ Assessment tools
- ☐ Educational software
- ☐ Learning tools (electronic devices, learning objects, maps, etc.)
- ☐ Data systems for educational institutions
- ☐ Teaching strategies or pedagogical models
- ☐ Other: *(please specify)* _____
- ☐ Other: *(please specify)* _____

11. Please rank the two most significant barriers to your institution's educational R&D activities? *(place a "1" for the most significant barrier and a "2" for the second most important barrier.)*

- ☐ Access to funding
- ☐ Access to skilled human resources
- ☐ Public perception / acceptance of R&D activities
- ☐ Other: *(please specify)* _____
- ☐ Other: *(please specify)* _____

12. Specify the headcount and full time equivalent (FTE) personnel devoted to total R&D activities and educational R&D activities in fiscal year <20xx>, by occupation.

Headcount refers to the total number of persons who are mainly or partially employed in R&D. This includes both "full-time" and "part-time" employed staff.

Full-time equivalent (FTE) refers to the total effort devoted to R&D in terms of personnel. As R&D may be carried out by persons who work solely on R&D projects or by persons who devote only part-time to R&D, it is necessary to estimate the full-time equivalent of the persons working only part-time in R&D. Examples of calculation: if out of five researchers engaged in R&D work, one works solely on R&D projects and the remaining four devote only one quarter of their working time to R&D, then: FTE = 1 + ¼ + ¼ + ¼ + ¼ = 2 researchers; if out of 3 researchers, one works for 6 months, one for 3 months, and one for one year, then: FTE = ½ + ¼ + 1 = 1.75.

Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned. Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work also fall into this category. Their rank is usually equal or superior to that of persons directly employed as researchers and they are often former or part-time researchers. Postgraduate students at the PhD level engaged in R&D should be considered as researchers.

Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Equivalent staff perform the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities.

Administrative support staff includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

	Headcount	FTE
Total R&D (all fields of science)		
Researchers		
Technicians and equivalent staff		
Administrative support staff		
Educational R&D		
Researchers		
Technicians and equivalent staff		
Administrative support staff		
Personnel not devoted to R&D		

Section 4. Funding of Educational R&D

If your organisation did not allocate any expenditures to fund educational R&D, please skip to section 5.

R&D is considered funded by your organisation if its outputs (e.g., publications, patents, product, services) belong to the recipient of the funds. Sub-contracting research should not be considered as funding. Funds passing through your organisation to another organisation should not be reported as funding either, for example because you co-ordinate a project funded by another agency and allocate the funding to different partners.

13. Specify the percentage of the total educational R&D funded by your organisation during fiscal year <20xx> by sub-area of educational R&D.

If the R&D activities funded by your institution belong to several of the categories below, please allocate them proportionately to the amount spent on the different sub-areas in your research. Should this be too difficult to estimate, please allocate the percentage evenly between the sub-areas concerned.

	Percentage
Educational Policy, Politics, and Social Context *Research on educational policy, including political, economic, legal and fiscal issues. Research on relations between educational processes and the social, political, and economic contexts in which they occur. Research on the evaluation of specific educational policies. Educational policy design.*	
Management, Organisation, and Leadership *Research on administration, management and organisation in the education sector, and sources and types of educational leadership, including administrators and other actors inside and outside of schools.*	
Learning, Instruction and Curriculum *Research on learning processes and instruction practices in formal and informal settings, for all age groups. Development of instructional methods based on learning and instruction research. Research on curriculum. Research on education for professions other than teaching (e.g., architecture, engineering, health professions, law).*	
Teaching and Teacher Education *Research on teaching and on teacher development and education from preservice through professional induction to the in-service stages of teachers' careers.*	
Assessment of Learning and Evaluation *Psychometrics and quantitative methods as applied to educational research as well as qualitative and evaluation methods as applied to educational research. Development of assessment tools.*	
Education Statistics and Research Methods *Research aimed at development and consolidation of educational indicators at different levels. Research aimed at improving quantitative and qualitative research methods in education.*	
Other *(please specify)* _____	
Total *(sum of all rows)*	100

14. Specify the percentage of the total educational R&D funded by your organisation during fiscal year <20xx> by level of education.

If the R&D activities funded by your institution belong to several of the categories below, please allocate them proportionately to the amount spent on the different education levels in the research you funded. Should this be too difficult to estimate, please allocate the percentage evenly between the sub-areas concerned.

	Percentage
Early childhood education	
Primary education	
Secondary education	
Tertiary education	
Adult education and lifelong learning	
Not applicable *Educational R&D that cannot be classified by sector of education*	
Total *(sum of all rows)*	100

15. Specify the percentage of the total educational R&D funded by your organisation during fiscal year <20xx> by the sector of recipient institution.

	Percentage
Government *This sector includes all bodies, departments and establishments of government at all levels –central, state or provincial, district or municipal. It includes non-private institutions controlled and mainly financed by government, but not administered by the higher education sector.*	
Higher education *This sector includes all universities, colleagues and other institutions of post-secondary education. It also includes all research institutes and experimental stations operating under the control of, administered by or associated with higher education institutions.*	
Industry *This sector includes all firms, organizations and institutions whose primary activity is the market production of goods and services for sale to the general public at an economically significant price.*	
Private non-profit *This sector includes non-market, private non-profit institutions serving the general public, other than those mainly financed by government or providing higher education services or administered by higher education institutions*	
Total *(sum of all rows)*	100

16. Specify the percentage of the total educational R&D funded in fiscal year <20xx> <u>by source of funding.</u>

Funds received for R&D funded during earlier periods or for R&D not yet started should be excluded from the sources of funds reported for the specific period.

	Percentage
Central government *Include awards and funds for educational R&D (including direct and reimbursed indirect costs) granted by all agencies of the central / federal government.*	
Local government *Include awards and funds for educational R&D (including direct and reimbursed indirect costs) from state, county, municipal, or other local government and their agencies.*	
Industry *Include all awards and funds for educational R&D (including direct and reimbursed indirect costs) from profit-making organizations. Do not include awards from non-profit foundations financed by industry; these should be included under Private non-profit.*	
Private non-profit *Include all awards and funds for educational R&D (including direct and reimbursed costs) from private non-profit institutions, regardless of their source of funding.*	
Own organisation funds *Include all funds (including related indirect costs) that your institution spent for educational R&D activities from the following unrestricted sources: tuition and fees; endowment income; gifts; and other funds generated by the institution.*	
International funds *Include all funds from the EU, international organisations, foreign governments, private non-profit, businesses, including from the same group.*	
Other sources *(please specify)* _____	
Total *(sum of all rows)*	100

17. Specify the percentage of the total educational R&D funded by your organisation during fiscal year <20xx> by type of R&D.

R&D is considered funded by your organisation if its outputs belong to the recipient of the funds. Please do not include any research sub-contracted to another organization.

	Percentage
Research (Basic and Applied) *Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view* AND *original investigation undertaken in order to acquire new knowledge but directed primarily towards a specific practical aim or objective.*	
Development *Systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.*	
Total *(sum of all rows)*	100

18. During fiscal year <20xx>, did your organisation fund the development of the following products/services, in whole or in part: *(tick as many as applicable).*

- ☐ Curriculum
- ☐ Textbooks and other learning/teaching resources
- ☐ Digital learning resources using advanced technology (e.g. intelligent tutoring systems, etc.)
- ☐ Assessment tools
- ☐ Educational software
- ☐ Learning tools (electronic devices, learning objects, maps, etc.)
- ☐ Data systems for educational institutions
- ☐ Teaching strategies or pedagogical models
- ☐ Other: *(please specify)*

_____

- ☐ Other: *(please specify)*

_____

Section 5. Additional information

Please provide comments below on any information you have supplied. Please specify the questions where you provided estimates rather than exact data.

Thank you for completing this questionnaire.

Annex 9.B. Example of information table for the unit mapping exercise

Institution information			Contact information					
Name of organisation	Sector	Educational R&D activity	First Name	Last Name	Position	E-mail	Phone	Remarks / Obs.

10 International trends in educational research output: a bibliometric approach

Stéphan Vincent-Lancrin, OECD

Gwénaël Jacotin, OECD

This chapter proposes a method to measure educational research based on academic publications. After presenting a semantic approach to identifying educational research output, it shows how the production and geographic distribution of the educational research output evolved over the past 30 years, how different disciplines contributed to this output and looks at other characteristics of educational research such as its collaborative nature or the balance between qualitative and quantitative publications.

Introduction

Bibliometrics is commonly used to measure the quantity and distribution of research across countries and topics, and sometimes the focus, collaborative nature and citation impact of countries' research (OECD, 2017[1])[1]. Countries have performed such bibliometric analysis of their educational research, either occasionally: Australia (Phelan, Anderson and Bourke, 2000[2]); Chile: (Brunner and Salazar, 2009[3]); or on a regular basis, e.g. Norway (Gunnes and Rørstad, 2015[4]). In some cases, a bibliometric approach has also been used to assess the distribution of educational research across countries (Sezgin, Orbay and Orbay, 2022[5]), the performance of educational research (Diem and Wolter, 2013[6]), the impact of COVID on educational research (Cretu and Ho, 2023[7]), etc.

This chapter explores the extent to which this method can be applied to the OECD educational research output, and, more broadly, to the global output of educational research. The main contribution of the chapter is to propose a methodology to define educational research through a semantic search rather than databases' pre-identified "education" categories. Indeed, educational research can be performed by researchers in different disciplines, and is a "topic of interest" as much as a "discipline". Limiting the educational research output to pre-categorised "education" categories may lead to missing a significant share of educational research.

The second objective of the chapter is to describe and analyse the evolution of the educational research output over time, its distribution across countries, but also a comparison with the overall research output or research outputs in other disciplines. We also show how educational research is distributed by discipline, and show that further semantic search could allow one to identify other characteristics of interest, for example how much of educational research is quantitative or qualitative. The conclusion points to what a regular data collection on educational research could look like.

Data and methodology

This section presents the main aspects of the bibliometric methodology used in this study. Annex 10.A presents it in more details. The main point is that we identify the educational research output (and thus the universe of our analysis) through a semantic search in the title and abstracts of the research papers.

The data source for this study is the open LENS bibliometric application about academic outputs. The application inventories scholar works from the following publication databases: OpenAlex (formerly Microsoft Academic Graph [MAG]), Crossref, PubMed, Core and PubMed Central. LENS provides information about the catalogued research output such as title, abstract, author's affiliations, year of publication, type of publication, discipline, etc. The databases cover over 240 million scientific documents, but this study focuses on the outputs included in the "analytics set" of the application (45% of the total database, that is 108 million documents): author information is indeed available for those documents, which include journal articles, book chapters, conference proceedings, conference proceeding articles, books, letters or reviews. Among them, over 82% are journal articles and 10%, book chapters.

The methodology to identify educational research articles is based on the presence of certain words or strings of letters (such as "educat", "student" or "teach") in the article title and/or abstract[2]. The choice of the words was done through an iterative process, with a manual verification on random sub-samples that the corresponding scientific output could be qualified as educational research. The method is a mix of trial and error based on the gradual elimination of "noise" within the different sub-samples of the corresponding universe, trying to find a limited combination of words that would not be too large and include too many non-educational articles or too narrow (and possibly miss too many). Given the size of the samples, only a probabilistic approach is possible. It arguably misses some academic educational research papers, includes some that are not "educational research", but provides a good estimate of the total educational research output, and, perhaps more importantly, of its evolution over time (assuming that the level of noise

and mistakes remains the same over time). For this reason, most of the analysis is presented in terms of evolution of percentages and shares rather than as the number of outputs.

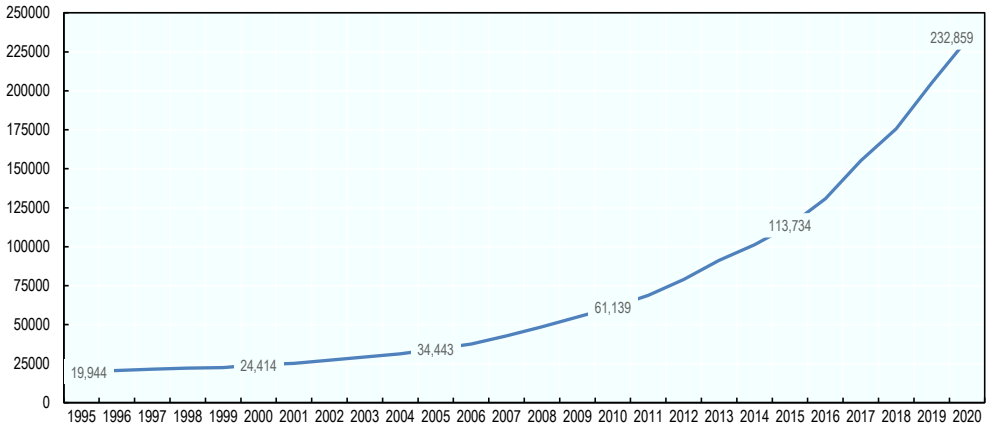
This method allowed us to define a relevant corpus of educational research output comprised of 2.6 million documents, an overwhelming majority being research articles. Educational research thus represents about 1% of the total research output – a share that (coincidentally) roughly corresponds to the 1% of public research funding it receives in the OECD area (Vincent-Lancrin, 2023[8]). Out of those documents, only 52% have an identified author and affiliation, which limits our useable dataset to 1.4 million documents. This is still a reasonable amount of information, acknowledging that the lack of useable information also concerns other research subjects (and databases). The assumption is that the remaining sample is representative of the 48% of documents for which we do not have sufficient information.

Trends in educational research

This section presents some of the big trends of educational research in terms of publication output. It covers the quantity of educational research output over time, its geographic distribution as well as some of its characteristics (discipline, collaboration, quantitative vs qualitative).

An increase in the educational research output

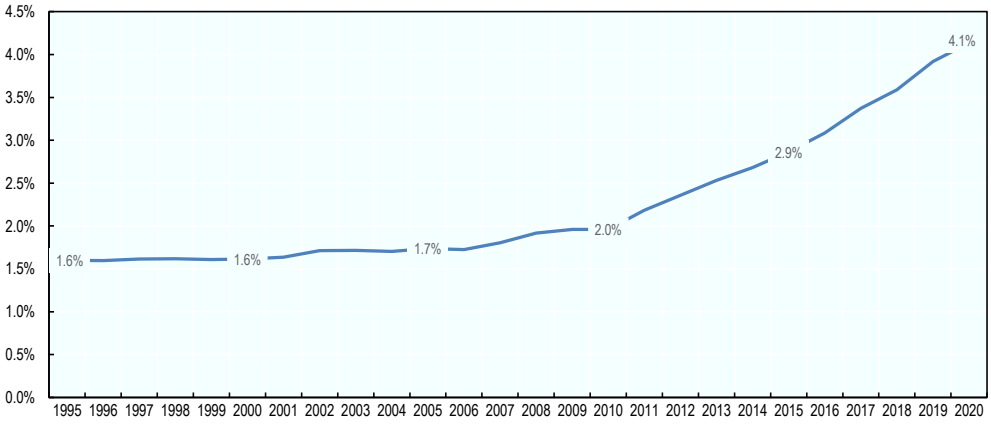
Figure 10.1. Educational research outputs in the world, 1995-2020



Note: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/f6jyol

Figure 10.2. Share of educational research outputs in the total research output, 1995-2020



Source: Authors' calculations adapted from the LENS analytics set

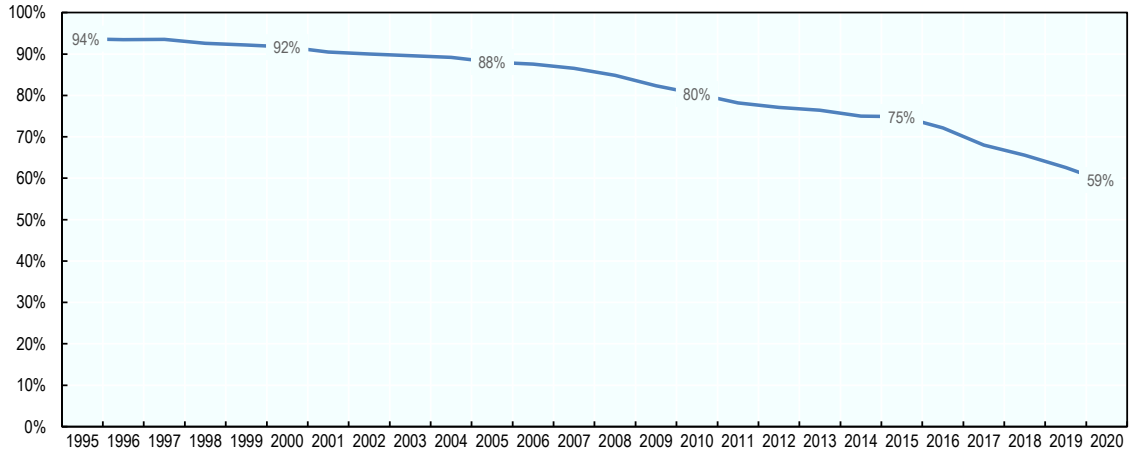
StatLink https://stat.link/tr4vgc

Figure 10.1 and Figure 10.2 show that the world educational research output has significantly increased, both in absolute and in relative terms (compared to the total research output). After a relatively stable production between 1995 and 2010, it has skyrocketed, going from 61 000 academic documents in 2010 to 233 000 in 2020. As a share of the total global research production, educational research went up from 1.6% to 4.1% between 1995 and 2020, showing that the production of educational research has grown more quickly than the overall research production. Part of this acceleration comes from the incentives provided to academics to publish more, whatever the domain, but as the trend in educational research outpaces the increase in the overall research output, it corresponds to a real increase in the interest of researchers and possibly research funders in education as a topic, possibly with the hope that research will contribute to educational improvement (OECD, 2007[9]; OECD, 2022[10]).

A declining share of OECD countries' output in the world output

Figure 10.3 shows that OECD countries produce most of the educational research in the world. Given the rapid increased of non-OECD countries' output, the share of the OECD area in the total educational research output has decreased over time, especially since 2015. In 2020, OECD countries produced 59% of the educational research publications, against 80% in 2010 and 94% in 1995. The OECD country output has continued to grow, but countries such as China, Brazil and Indonesia have significantly increased their output from a very low starting point during the same period. Educational research is becoming more important and distributed globally, and not just within the OECD, which opens new possibilities for international collaboration and peer learning. As educational improvement is also situated in a certain country context and the gained knowledge is not always transferable across countries, the local production of educational research provides more opportunities for the improvement of education worldwide.

Figure 10.3. Share of educational research outputs of OECD countries in total educational research output, 1995-2020

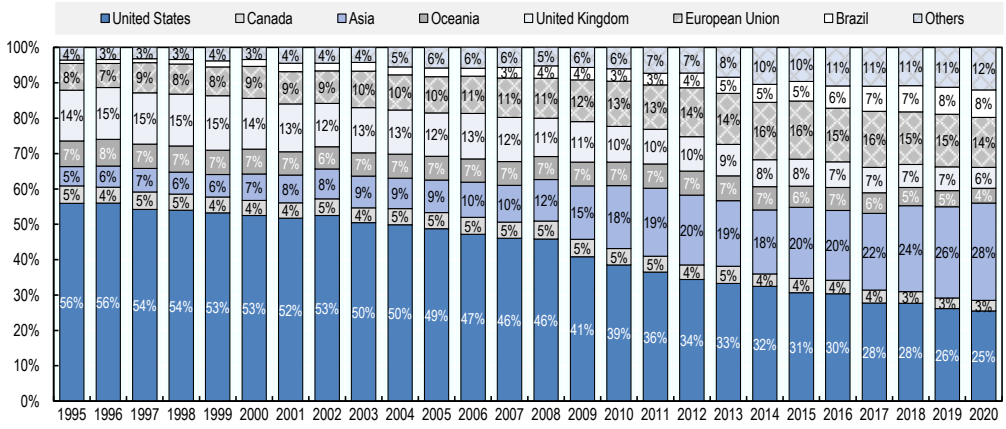


Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/xq1wu6

Figure 10.4 presents the distribution of educational research in the world by major countries or areas of production as a share of the total research output.[3] The United States has remained by far the largest country producing educational research outputs within the OECD and in the world, with a 5-fold increase of its outputs between 1995 and 2020. However, its share in the world production has steadily decreased as a result of the growth of other countries' output. Since 2008, educational research publications from Asian countries, notably China and Indonesia, have skyrocketed and reached US levels. The production of the European Union and Brazil has also increased significantly – while the educational research of Canada, the United Kingdom or Oceania has also doubled, but increased much less than in most other countries. That being said, as shown in Figure 10.4, the United Kingdom is one of the largest educational research producer in the OECD and in the world, accounting for about 6% of education research articles in 2020, and one of the few countries that concentrate about 3% or more of the educational research output in the world with the United States (26%), Brazil (8%), Indonesia (6%), China (5%), Australia (3%), Canada (3%) and Spain (3%).

Figure 10.4. Share of countries/regions' output in total educational research output, 1995-2020



Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/iwkso7

Table 10.1. Country share of the world's educational research output, 1990-2020

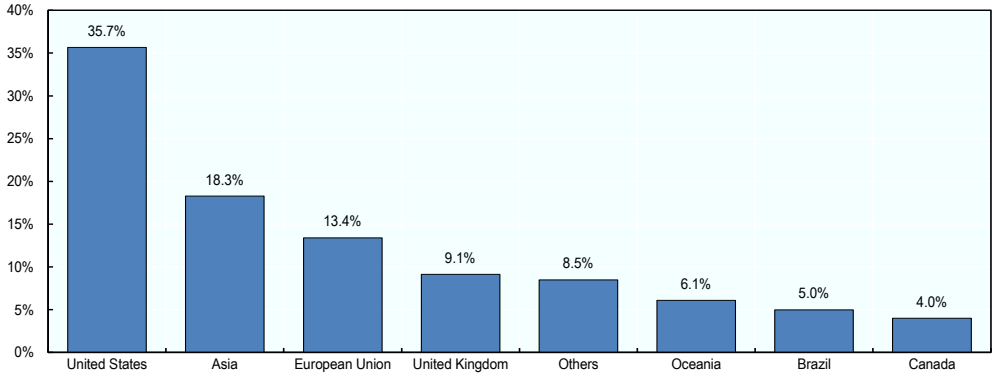
	1990	1995	2000	2005	2010	2015	2020
Australia	4.4%	6.6%	6.1%	5.6%	5.4%	4.9%	3.5%
Austria	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.3%
Belgium	0.2%	0.3%	0.5%	0.4%	0.5%	0.5%	0.4%
Canada	4.4%	5.0%	4.2%	4.6%	4.6%	4.0%	3.0%
Chile	0.3%	0.3%	0.2%	0.3%	0.4%	0.5%	0.4%
Colombia	0.1%	0.1%	0.1%	0.3%	0.5%	1.0%	0.6%
Costa Rica	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
Czech Republic	0.2%	0.1%	0.1%	0.1%	0.2%	0.6%	0.3%
Denmark	0.3%	0.2%	0.2%	0.3%	0.3%	0.5%	0.3%
Estonia	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%
Finland	0.4%	0.5%	0.5%	0.5%	0.6%	0.7%	0.6%
France	0.4%	0.3%	0.4%	0.5%	0.4%	0.3%	0.3%
Germany	1.7%	1.2%	1.7%	1.4%	1.8%	1.9%	2.0%
Greece	0.0%	0.2%	0.4%	0.6%	0.7%	0.6%	0.6%
Hungary	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
Iceland	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%
Ireland	0.2%	0.3%	0.4%	0.6%	0.8%	0.6%	0.5%
Israel	1.3%	1.2%	1.3%	1.3%	0.7%	0.6%	0.5%
Italy	1.1%	0.6%	0.6%	0.7%	0.8%	1.1%	1.0%
Japan	1.3%	1.2%	1.4%	1.3%	1.6%	1.6%	1.3%
Korea	0.1%	0.2%	0.4%	0.5%	1.0%	2.2%	0.7%
Latvia	0.1%	0.0%	0.1%	0.1%	0.1%	0.3%	0.1%
Lithuania	0.0%	0.0%	0.0%	0.1%	0.1%	0.4%	0.2%
Luxembourg	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Mexico	0.3%	0.2%	0.2%	0.3%	0.4%	0.9%	1.1%
Netherlands	1.1%	1.2%	1.2%	1.2%	1.2%	1.0%	0.6%
New Zealand	0.9%	0.6%	0.9%	1.2%	1.1%	1.0%	0.6%
Norway	0.4%	0.4%	0.3%	0.4%	0.5%	0.5%	0.6%
Poland	0.1%	0.1%	0.1%	0.2%	0.3%	0.7%	0.9%

	1990	1995	2000	2005	2010	2015	2020
Portugal	0.1%	0.1%	0.2%	0.2%	0.4%	0.6%	0.6%
Slovak Republic	0.0%	0.1%	0.1%	0.1%	0.0%	0.3%	0.2%
Slovenia	0.0%	0.0%	0.2%	0.2%	0.2%	0.2%	0.2%
Spain	0.7%	0.8%	1.1%	1.4%	2.3%	3.3%	3.1%
Sweden	0.5%	0.8%	0.9%	1.1%	1.1%	1.2%	1.0%
Switzerland	0.4%	0.3%	0.3%	0.3%	0.4%	0.4%	0.3%
Turkey	0.2%	0.2%	0.3%	0.9%	2.6%	3.0%	1.6%
United Kingdom	11.9%	14.4%	14.4%	12.3%	10.1%	7.6%	5.9%
United States	60.6%	55.9%	52.5%	48.7%	38.5%	30.6%	25.5%
OECD total	**93.8%**	**93.7%**	**91.7%**	**88.0%**	**80.4%**	**74.8%**	**59.1%**
Argentina	0.1%	0.1%	0.1%	0.2%	0.2%	0.4%	0.5%
Brazil	0.6%	1.0%	2.0%	2.5%	3.5%	5.5%	7.8%
Bulgaria	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
Croatia	0.0%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%
Peru	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.3%
Romania	0.0%	0.0%	0.0%	0.0%	0.3%	0.9%	0.4%
China	0.4%	0.7%	1.4%	1.7%	6.3%	3.2%	5.3%
India	0.5%	0.4%	0.5%	0.7%	1.0%	1.6%	2.0%
Indonesia	0.1%	0.0%	0.0%	0.0%	0.1%	1.0%	6.0%
South Africa	0.9%	0.8%	0.8%	1.5%	1.5%	2.4%	2.1%

Source: Authors' calculations adapted from the LENS analytics set

Figure 10.5 presents the cumulative stock of educational research output from 1995 to 2020 by country or region of origin. As current research is likely to build on what has been produced in the past decades (and not just the past years), this gives us an idea of the possible geographical influence of research from different countries/regions (assuming all papers have the same chance to have an influence). Ideally, this should be supplemented by an analysis of the citation impact of research from different regions, which was not possible in the framework of this study. The United States and Canada have produced about 40% of the "legacy" research output, the Asia-Pacific region, about 24%, and EU countries and the United Kingdom, about 22%.

Figure 10.5. Cumulative stock of educational research by country/region of production, 1995-2020



Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/k1bje8

While the quantity of output produced every year matters to give an idea of where production is most valued, it does not provide an indicator of the quality of the produced educational research. One could even argue that a smaller but higher quality output is more helpful to improve the quality of education than a large output with mixed quality research. On the other hand, educational research is developed by producing medium level capacity outputs and gradually building a culture of research excellence.

The increase in China's output mirrors (to a much lesser extent) what can be observed in other scientific domains and other papers using different databases (Sezgin, Orbay and Orbay, 2022[5]). The increase in the shares of Brazil and Indonesia as large producers of educational output should be taken with more caution as this is not a trend that was documented elsewhere. It might come from the database used and an uneven distribution of papers with identified authors and abstracts. Another explanation could also be measurement error that would entail more "false positives" (educational research documents that should not be included in this category) in these countries than in others. A quick review of their recent production seems to indicate that most educational research outputs are produced in medicine, science and computing – areas where articles are much shorter than the typical social science documents. This "specialisation" could also explain the more rapid growth compared to other countries. This analysis is beyond the scope of this study though.

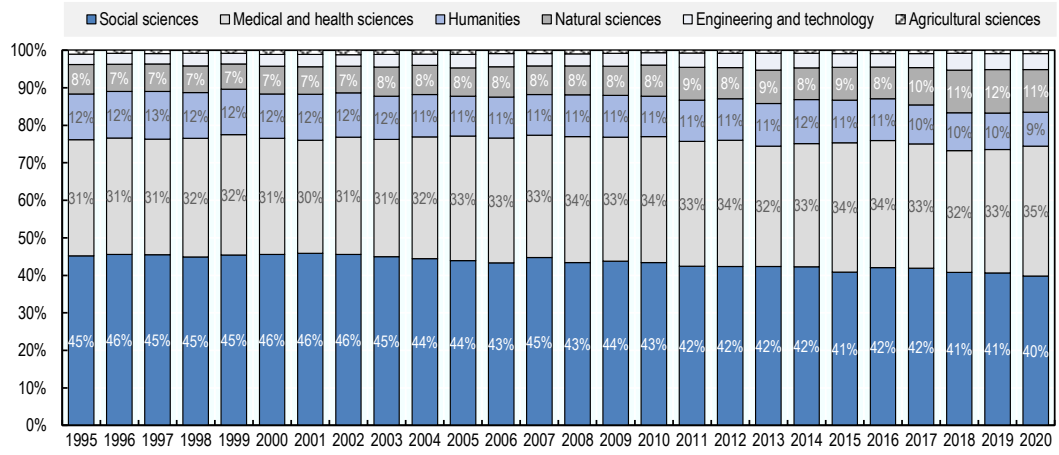
How much different fields of study contribute to educational research

Identifying educational research articles through a semantic search allows one to identify papers produced in more disciplines than "education sciences". This is important as education is as much a subject as it is a discipline. While in some countries it has become a discipline (with its education schools or faculties), in others it is still a "subject" dealt with by a number of other actors: economists, sociologists, political scientists, but also scientists or computer scientists who do not necessarily identify as "educational researchers" but as scientists from another domain working on education, often doing "discipline-based education research".

In the LENS database, all articles are associated with a disciplinary subject such as "education", "general medicine", "developmental and educational psychology", "public health, environmental and occupational health", "sociology and political science", "linguistics and language", etc. The taxonomy includes 332 different subjects, which we reclassified according to the international taxonomy of "fields of science": natural sciences (1), engineering and technology (2), medical and health sciences (3), agricultural sciences (4), social sciences (5), and humanities (6). In the case of social sciences, where we expected to find a significant amount of education research outputs, we also went to the next level of the classification: psychology (5.1), economics and business (5.2), educational sciences (5.3), sociology (5.4), law (5.5), political science (5.6), social and economic geography (5.7), media and communications (5.8), and other social sciences (5.9).

Figure 10.6 shows the distribution of educational research across fields of science. Social sciences accounted for 40% of education research in 2020, a small decrease from 45% in 1995, while humanities remained stable around 10%. What we typically have in mind when thinking of educational research thus represent about half of it. A significant amount of research is also carried out in the fields in which countries spend more of their public research budget: medical and health sciences (35% of the output in 2020), natural sciences (11%) and engineering and technology (4%).

Figure 10.6. Distribution of educational research by field of science, 1995-2020

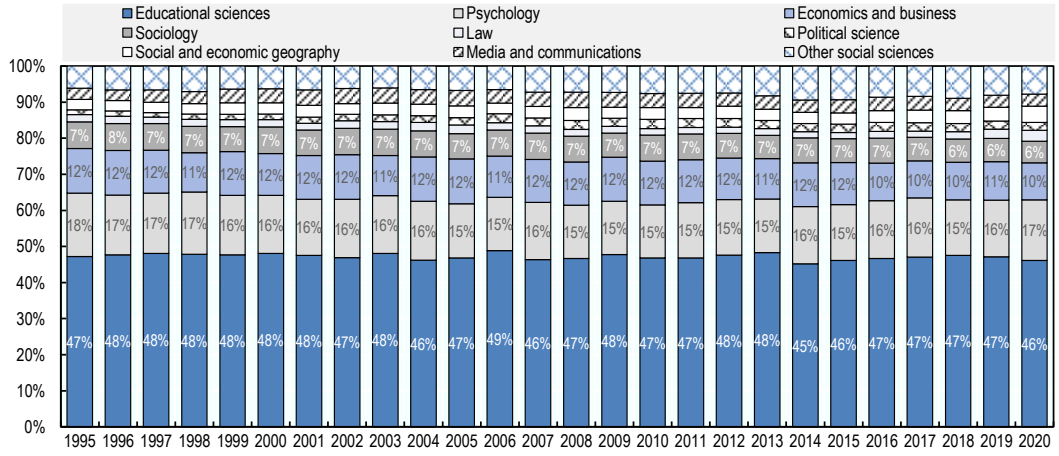


Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/jhz9io

In 2020, articles classified as educational sciences represented 18% of the total educational research output, psychology, 7%, economics, 4%, sociology, 2%, and the other social science fields, the remaining 8%. Here again, it is noteworthy that the distribution remained stable over time. Figure 10.7 presents the same information by zeroing in on the social science output of educational research: educational sciences and psychology represent about 60% of the social science educational research output.

Figure 10.7. Share of educational sciences, psychology and other sub-fields of social sciences in the total educational research output of social sciences, 1995-2020



Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/riv1qh

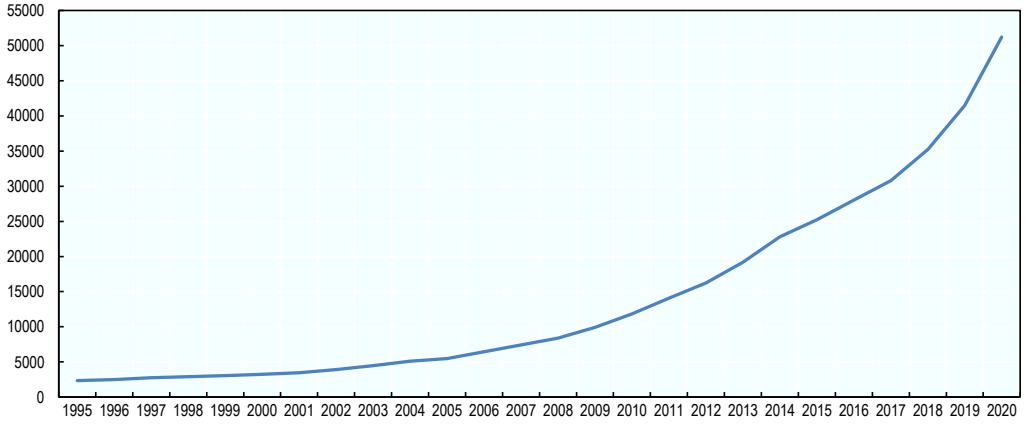
An increasing amount of quantitative educational research outputs

Discussions on educational research in the past decades included considerations about the balance between different types of research, what counts as "evidence" and how research is used (OECD, 2007[9]; OECD, 2022[10]). Some have lamented that educational research was based on weak theoretical bases that did not give more room to neuroscience. Others have complained that it was too estranged from causal inference, with debates about different ways to get close to such causal inference (Schneider et al., 2007[11]). Sometimes, the debate turns around the share between qualitative and quantitative research, with the idea that quantitative empirical research which can generalise to an entire education system is still not frequent enough, partly because of a lack of data collected by governments or made available to researchers, partly because of the epistemic traditions of educational science, which was initially anchored in humanities, developmental psychology and pedagogical research. One can assume that the surge of data collected within countries as well as the shift towards exploring causal inference in social science may have led to an increase in quantitative educational research papers.

We have tried to capture the quantitative nature of different articles through another semantic. We identified the educational research papers with the following words in their abstract: "data", "sample", "statistic", "control group" as well as "quantitativ" and "estimat". The same iterative method including a manual check of a random sample showed that the technique was reliable to identify papers using a quantitative methodology – acknowledging that this is just an estimate. Again, trend values thus represent the most important aspect of the analysis. Since 2009, quantitative educational research papers have increased 5-fold (assuming that the trend was the same for articles that missed an abstract and could not be analysed, see Figure 10.8). Figure 10.9 shows that the percentage of quantitative papers in total educational research output has almost doubled since 1995 and significantly increased since 2009 to represent about 36% of the total research output in 2020.

Figure 10.8. The increase in the number of quantitative educational research outputs

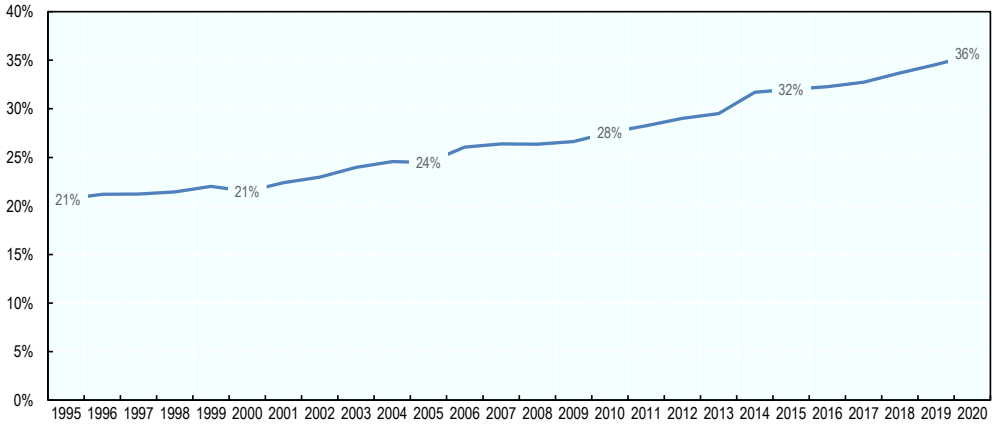
Evolution of number of quantitative outputs (based on articles with abstracts), 1995-2020



Note: This figure is presented to illustrate the shape of the trend rather than provide numbers. The calculations are based on the 56% of educational research outputs with an abstract
Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/hsm7yb

Figure 10.9. The increase in the share of quantitative educational research



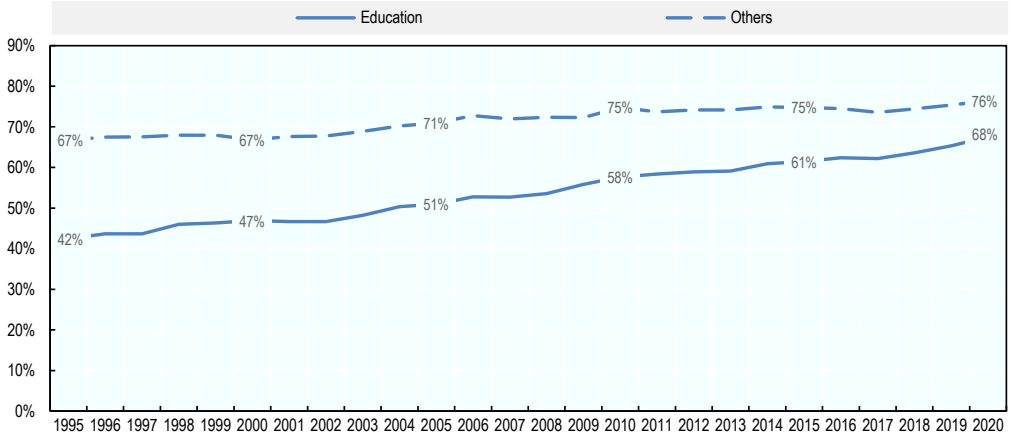
Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/d4bjv1

An increasingly collaborative educational research

Finally, educational research is becoming increasingly collaborative, with an increasing number of research output jointly credited to several authors (Figure 10.10). While educational research was still less collaborative in terms of published outputs than other areas, it is catching up and went up from 42% to 68% between 1995 and 2020. By contrast, the share of collaborative output in all other domains has increased from 67% to 76% over the same period. We could unfortunately not compute the share of international collaborative research, which has increased as a general trend (OECD, 2017[1]). Our previous study based on SCOPUS (and thus having a slightly different methodology) showed a similar trend towards more collaborative output, including international collaborative output (Vincent-Lancrin and Jacotin, 2018[12]).

Figure 10.10. Share of educational research documents written in collaboration, 1995-2020



Source: Authors' calculations adapted from the LENS analytics set

StatLink https://stat.link/9hstk4

Conclusion

The main purpose of this study was to show that valuable information about the educational research internationally can be derived from a bibliometric approach. Using a public bibliographic tool (LENS) with a very large coverage of academic publication, we found the following results:

- Educational research has increased both in quantity and as a share of the general research output;
- OECD countries produce the majority of the educational research output, but their share in the world output has decreased over the past decades;
- The United States is by far the first producer of educational research, but its share has also decreased over the past decades, with countries such as Brazil, Indonesia and China having significantly increased their output from a low starting point in the past few years;
- Educational research is mainly produced by researchers in the social sciences and in humanities, but half of it was produced in other fields of science in 2020, notably the health and natural sciences;
- Educational research has become increasingly quantitative in nature in the past decades, even though its qualitative output remains largely prevalent;
- Educational research is converging towards the same patterns as other disciplines in terms of collaboration (as measured by co-authored documents).

There are many other types of analyses that bibliometric approaches could make possible. While it was beyond the scope of this study, one could analyse the citation impact of different countries, the levels of inter-citation (and thus inter-connection) between different subfields of science, international collaboration, the extent to which patents cite educational research articles (and vice versa) and thus, how educational research connects with educational development. Even the "topics" researched might be captured through bibliometrics.

There are some limitations with bibliometric studies. The large amount of data and the incompleteness of the publication databases means that noise and measurement errors will tend to be large. It is thus recommended to run similar analyses with different databases before making strong conclusions. Work with both SCOPUS and LENS (using OpenAlex and other publication databases) shows that the results are relatively stable and that the general trends can be found independently of the database used (see Annex 10.A.). Using bibliometric data to compare the "performance" or "productivity" of different countries (or domains) may also be difficult.

First, there are language issues. While an increasing number of educational researchers publish in English, they still tend to publish in their country's language as their research may then have more impact on their education system. The multiplicity of languages in international comparisons complicates bibliometric approaches as ideally the research terms should be provided in all languages.

Second, the quantity of output between different fields of study may be misleading as different disciplines have different publication traditions (or expectations): in some disciplines it is common to publish a large number of research papers a year, whereas it is not the case in others. This can for example depend on the number of co-authors (as extensive co-authorship can lead to greater citation impact (Parish, Boyack and Ioannidis, 2018[13]). The standards are particularly different between health or computer science and social science (as social science research outputs typically involve less co-authors and are longer).

Third, it is very difficult to assess the quality of educational research through this means, even though this is what really matters at the end. The use of citation impact has its limitations as networks of low quality research may reach high citation impact. Limiting bibliometric analysis to a specific set of pre-defined "high

quality" journals is not fully convincing either as this does not allow for other poles of quality to emerge (nor reflect what may actually influence decision makers). Citation impact is also related to the nationality of authors or co-authors and thus give an advantage to large communities of researchers in a specific language, at least in fields such as educational research where not all the research output is published in English. For these reasons, bibliometric information should mainly be used to document the quantity rather than quality of the research output (or productivity and performance of countries).

Given the limitations mentioned above, trend data provide reasonably good comparative information. Without much investment, countries could produce yearly indicators about educational research within the OECD area and its partner economies, as is the case in other fields of science. Such information would for example allow countries with small educational research output to promote more production of educational research, help identify ways to bring together disconnected research communities and measure progress, identify collaboration opportunities, and evaluate the extent to which the quantity of research correlates with its use or with the quality of countries' education.

One of the methodological novelties of this chapter is to identify the educational research output through a semantic search. The approach adopted in this chapter can certainly be improved and such approaches have to be tailored to each database (and tool), but as education is both a "sub-field of science" and a subject of research for different fields (or "socio-economic objective"), we recommend to use this type of methodology. Only in this way can one capture the educational research output produced in fields of science that may have a different scientific tradition but contribute to understanding educational processes from different perspectives.

References

Brunner, J. and F. Salazar (2009), "La investigación educacional en Chile: Una aproximación bibliométrica no convencional", *Documento de Trabajo CPCE Nº 1*. [3]

Cretu, D. and Y. Ho (2023), "The Impact of COVID-19 on Educational Research: A Bibliometric Analysis", *Sustainability*, Vol. 15/6, https://doi.org/10.3390/su15065219. [7]

Diem, A. and S. Wolter (2013), "The use of bibliometrics to measure research performance in education sciences", *Research in Higher Education*, Vol. 54/1, pp. 86-114, https://doi.org/10.1007/s11162-012-9264-5. [6]

Gunnes, H. and K. Rørstad (2015), *Educational R&D in Norway 2013: Resources and Results*, NIFU, http://hdl.handle.net/11250/2412424. [4]

OECD (2022), *Who Cares about Using Education Research in Policy and Practice?: Strengthening Research Engagement*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/d7ff793d-en. [10]

OECD (2017), *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*, OECD Publishing, Paris, https://doi.org/10.1787/9789264268821-en. [1]

OECD (2007), *Evidence in Education: Linking Research and Policy*, OECD Publishing, https://doi.org/10.1787/9789264033672-en. [9]

Parish, A., K. Boyack and J. Ioannidis (2018), "Dynamics of co-authorship and productivity across different fields of scientific research", *PLOS ONE*, Vol. 13/1, https://doi.org/10.1371/journal.pone.0189742. [13]

Phelan, T., D. Anderson and P. Bourke (2000), *Educational research in Australia: a bibliometric analysis*, Higher Education Division, Department of Education, Training and Youth Affairs. [2]

Schneider, B., M. Carnoy, J. Kilpatrick, W. Schmidt and R. Shavelson (2007), *Estimating Casual Effects Using Experimental and Observational Designs*, American Educational Research Association, https://www.aera.net/portals/38/docs/causal%20effects.pdf. [11]

Sezgin, A., K. Orbay and M. Orbay (2022), "Educational Research Review From Diverse Perspectives: A Bibliometric Analysis of Web of Science (2011–2020)", *SAGE Open*, Vol. 12/4, https://doi.org/10.1177/21582440221141628. [5]

Vincent-Lancrin, S. (2023), *Public budget and expenditures in educational R&D: towards a new generation of international indicators?*, OECD Publishing. [8]

Vincent-Lancrin, S. and G. Jacotin (2018), *Education Research Indicators Worldwide*. [12]

Annex 10.A. Methodology

This annex presents the methodology to identify the educational research sample in more details and compares it with another approach that was tested by the authors in a previous study. Vincent-Lancrin and Jacotin (2018[12]) developed a methodology on the SCOPUS bibliometric database to identify the educational research output through a semantic search. The method was adapted to the LENS database and tool. The first section of this annex presents the initial methodology, then shows how it was adapted to LENS, before comparing the results of the two approaches on the period that is common to the two studies.

Past methodology with SCOPUS

The methodology that was used with the SCOPUS database allowed for a nuanced semantic search and categorisation of the educational research output. At the time of the study, in 2016, SCOPUS covered more than 21 500 peer-reviewed journals across the world and provided information about research output such as title, abstract, author's affiliations, year of publication, type of publication, discipline (SCOPUS classify journals in broad fields of science: social sciences, health sciences, physical sciences and life sciences), etc. The considered only articles published since 1996 (more than 60% of the full database). (The OECD and UNESCO – United Nations Educational, Scientific and Cultural Organization – databases on education enrolment and R&D expenditures' in higher education were also used to compute different indexes.)

In order to determine which research articles could be considered as educational search, we carried out a semantic search in the title and abstract fields of the research articles. Through an iterative process, we defined a set of search terms related to education, separated in two different classes, which could be "strongly" or "weakly" related to education topics. The list of specific terms is the following:

- "Strong" terms: *educat* (in English, French, Spanish & *bildung* for German) without prefix, *student*, *teach*, *school* (*schul* in German) without prefix and suffix, *academ* (*akadem* in German), *curricul*, *classroom*, *pedagog* (*padagog* in German), *campus* without prefix, and *kindergarten*;
- "Weak" terms: *learn* (*lehrer* in German), *gradu*, *traini* or *traine* without prefix, *instruct*, *college*, *facult*, *cognit* without prefix, *intel*, *tutor* and *didact*

Annex Table 10.A.1. Number of identified education articles by search criteria

	Title		Abstract		
	Strong	Weak	Strong	Weak	Total
At least	1	0	0	0	474 836
At least	0	1	1	2	65 300
At least	0	0	3	0	53 522
At least	0	0	2	1	50 279
Total					643 937

Source: Authors' calculations adapted from the SCOPUS database

To identify education articles, we drew different random samples of articles from more restrictive to less restrictive conditions and iteratively constructed the semantic search that yielded the most satisfactory results. Through this process, we retained as educational research articles those that included:

- At least one "strong" term in the title; or
- At least one "weak" term in the title, one "strong" term and two "weak" terms in the abstract; or
- At least three "strong" terms in the abstract; or
- At least two "strong" terms and one "weak" term in the abstract.

The number of articles retained by applying this search strategy is reported in Annex Table 10.A.1.

As shown in Annex Table 10.A.2, the terms "*educat*" and "*student*" are those with the highest occurrence within the 643 937 articles of education.

Annex Table 10.A.2. Occurrences of each term among articles in education

	Title	Abstract	Total	%
Strong words				
educat	172 675	300 043	357 074	55.5%
student	122 869	304 615	325 913	50.6%
teach	102 996	207 029	238 099	37.0%
school	55 928	124 199	144 460	22.4%
academ	43 514	98 540	118 044	18.3%
curricul	22 219	74 831	81 893	12.7%
classroom	17 797	55 055	61 563	9.6%
pedagog	10 067	36 643	40 394	6.3%
campus	5 108	13 063	14 779	2.3%
kindergarten	2 328	5 363	5 836	0.9%
Weak words				
learn	77 308	191 570	202 608	31.5%
gradu	22 640	82 851	88 978	13.8%
train(i/e)	22 667	81 025	85 134	13.2%
instruct	11 520	59 695	61 813	9.6%
college	18 849	53 709	57 772	9.0%
facult	6 920	41 083	42 346	6.6%
cognit	7 394	41 092	41 763	6.5%
intell	6 903	21 528	22 465	3.5%
tutor	3 768	12 801	13 158	2.0%
didact	793	6 962	7 179	1.1%

Source: Authors' calculations adapted from the SCOPUS database

Some search terms initially in the list above were later on removed. This is the case of the term "*university*" which, despite its clear connection to higher education, is often used at the end of the authors' title or in the abstract for the purpose of listing the institutional affiliation of the authors. This term was present in the title or abstract of 790 694 articles. Only 7% of them (55 418) were published in journals of education and among them, 42 047 (76%) were included in our education sample according to the criteria defined above. In comparison, the term "*educat*" (702 412) is less frequently used but 21% of articles containing this term are published in journals of education. This is three fold more frequent than the term "*university*".

In full count, there are 386 662 articles published in journals of education. 209 861 (54%) among them are included in our education sample. However, it is important to underline that around 75 000 articles in journals of education don't have an abstract (used as criteria of inclusion, except for the most restrictive criteria), reducing their probability of inclusion. Among them, only 30% are included thanks to their title.

Methodology with LENS

The methodology used to identify the sample of educational research output is presented in the first section of the paper. It very much followed the idea of the previous semantic search, but in a simplified way.

Annex Table 10.A.1 presents some details about the LENS database, notably the number of papers with an affiliation (this a country) and the characteristics of the analytics set that is designed for bibliometric studies and includes papers with more affiliations and abstracts. While the database includes a variety of scholarly documents, the large majority are journal articles and book chapters.

Annex Table 10.A.3. Characteristics of the scholar work in the LENS database

	Number	Percent
Scholar work in the database	**236 413 556**	
With affiliation	80 364 549	34%
Scholar work in the analytics set of the database	**107 987 328**	
With affiliation	64 182 466	59%
With abstract	66 513 909	62%
Type of publication in the analytics set of the database	**107 987 328**	
Journal article	88 705 081	82%
Book chapter	10 727 488	10%
Conference proceedings	4 326 786	4%
Conference proceedings article	2 509 192	2%
Book	1 604 529	1%
Letter	94 280	0%
Review	19 972	0%
Type of information in the education analytics set of the database	**2 629 809**	
With affiliation	1 376 458	52%
With abstract	1 478 685	56%

Source: LENS

Annex Table 10.A.2 presents the different sequences of characters of works that were used to identify the educational research corpus. In the case of LENS, just working on the titles rather than both title and abstract was much easier and yielded similar results to the more complex criteria used on the SCOPUS database. The method allowed us to identify 2.6 million educational research papers. Random sub-samples were checked manually to assure that the output qualified as educational research in the sense that education was one of its subjects.

Annex Table 10.A.3 shows the sequence of characters that have been used for the search to identify quantitative papers using the documents' abstracts. The analysis with SCOPUS also included some characters that could not be used in LENS ("=", "<", ">" and "%"). The same methodology that had been validated was then reused and the selection included documents with either a strong word in its abstract

(432 091) or two weak ones (296), leading to identifying a total of 432 377 documents with a quantitative methodology (which sub-samples checked manually).

Annex Table 10.A.4. Identification of the education analytic set

	Character sequence	Title	%
	educat	903 524	34.4%
	educac	98 877	3.8%
	bildung	18 661	0.7%
Educat		**1 015 269**	**38.6%**
	student	579 567	22.0%
	teach	527 291	20.1%
	school	494 086	18.8%
	schul	295	0.0%
School		**494 378**	**18.8%**
	academ	210 312	8.0%
	akadem	17 463	0.7%
Academ		**227 329**	**8.6%**
	curricul	99 679	3.8%
	classroom	81 451	3.1%
	pedagog	83 445	3.2%
	padagog	6 908	0.3%
Pedagog		**90 326**	**3.4%**
	campus	25 584	1.0%
	kindergarten	10 811	0.4%
Total		**2 629 809**	

Source: Authors' calculations adapted from the LENS analytics set (30 August 2021)

Annex Table 10.A.5. Identification of the quantitative educational research output

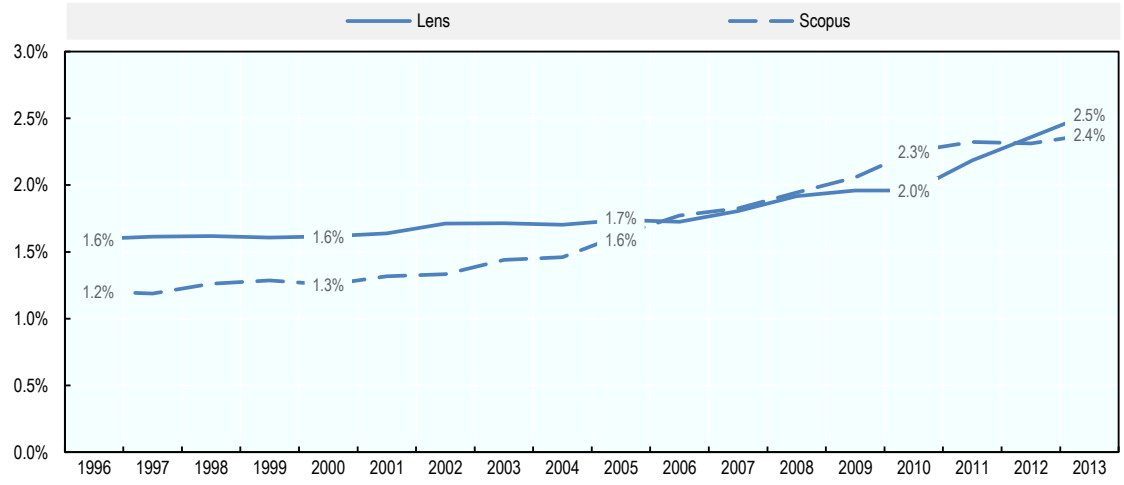
	Character sequence	Abstract	% education research	% quantitative
strong words				
	data	303 276	20.5%	70.1%
	sample	133 311	9.0%	30.8%
	statistic	85 493	5.8%	19.8%
	control group	50 144	3.4%	11.6%
weak words				
	quantitativ	46 989	3.2%	10.9%
	estimat	33 392	2.3%	7.7%
	gauss	75	0.0%	0.0%

Source: Authors' calculations adapted from the LENS analytics set (30 August 2021)

Robustness check: comparing the results of the two studies

While one of the well-known weakness of bibliometric studies lies in the strengths and weaknesses of each database, the use of two different ones allowed us to compare results. They show that while the levels can be slightly different for the two studies, the trend is similar.

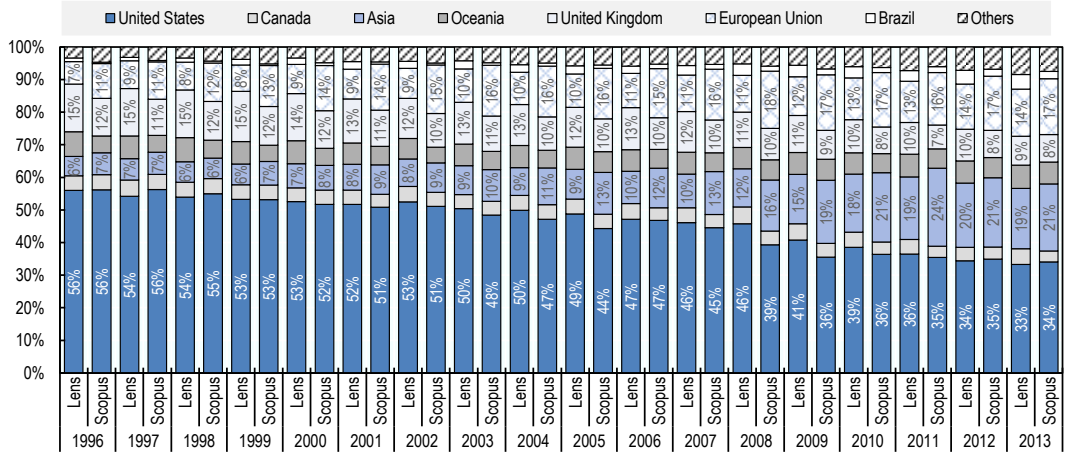
Annex Figure 10.A.1. Evolution of the share of the educational research output in the total research output based on the two studies



Source: Authors' calculations adapted from the LENS and SCOPUS databases

StatLink https://stat.link/sijp58

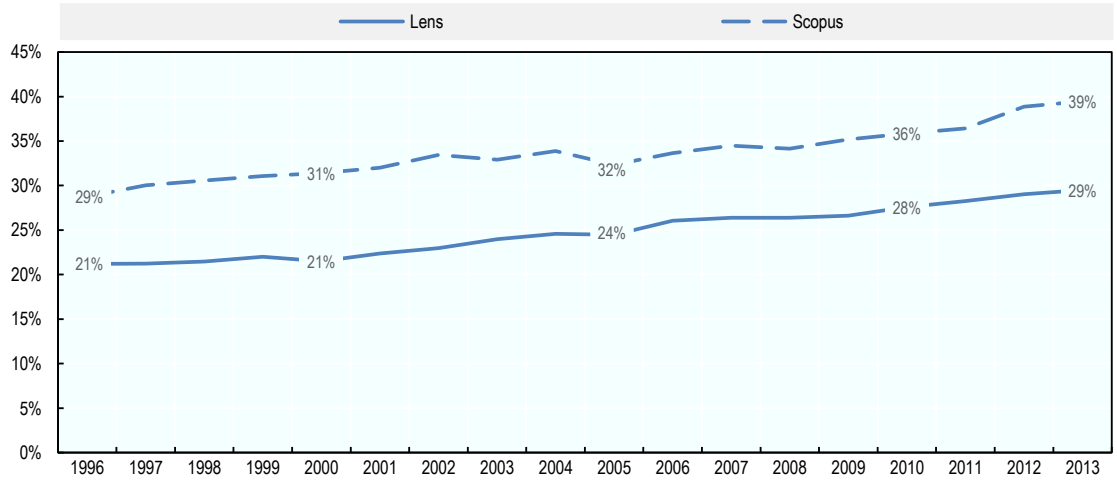
Annex Figure 10.A.2. Evolution of the share of countries/regions' output in the world educational research output based on the two studies



Source: Authors' calculations adapted from the LENS and SCOPUS databases

StatLink https://stat.link/zl7635

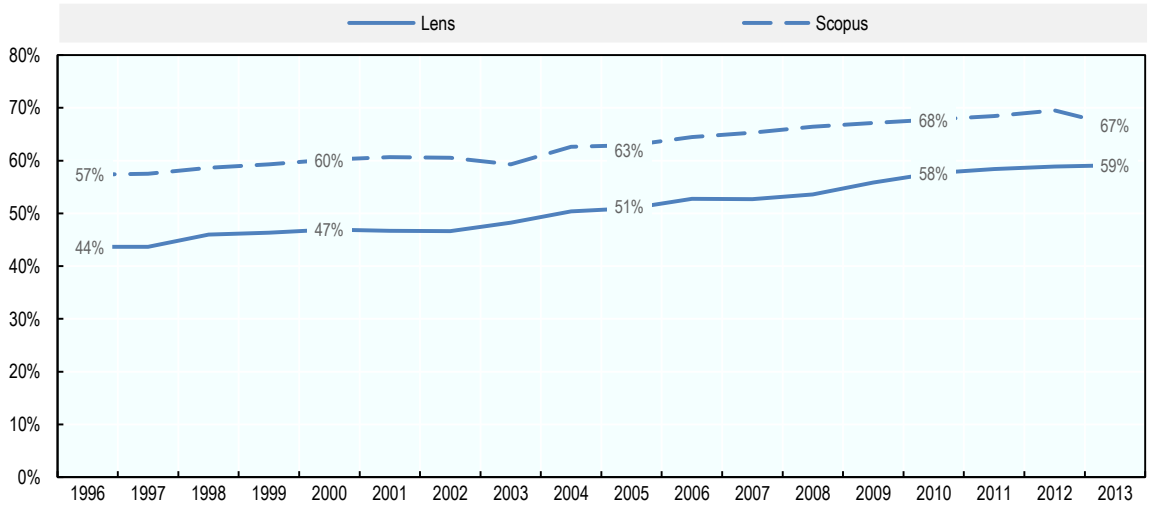
Annex Figure 10.A.3. Evolution of the share of quantitative educational research output based on the two studies



Source: Authors' calculations adapted from the LENS and SCOPUS databases

StatLink https://stat.link/16n79b

Annex Figure 10.A.4. Evolution of the share of collaborative educational research output based on the two studies



Source: Authors' calculations adapted from the LENS and SCOPUS databases

StatLink https://stat.link/vqw6px

Notes

[1] See https://www.oecd.org/sti/scoreboard.htm#explore for the OECD STI Scoreboard platform.

[2] For time and budget reasons, we simplified the methodology that we developed and piloted for a previous, unpublished study using another bibliometric database: the educational research output was effectively identified through a conditional method that is also presented in Annex 10.A and included a mix of "strong" and "weak" words (or strings of characters) in the title and/or abstract of the papers for the search. In the case of LENS, the addition of conditions did not seem to make much difference to the research output (but increased the time and complexity of the queries) which led to a simplification of the methodology.

[3] The presented classification here is based on the university affiliation of the authors. The public LENS application does not allow one to do fractional counts. However, a comparison with a previous unpublished research based on SCOPUS implementing fractional counts shows that the results are similar.

Educational Research and Innovation

Measuring Innovation in Education 2023

TOOLS AND METHODS FOR DATA-DRIVEN ACTION AND IMPROVEMENT

Measuring innovation in education and understanding its drivers and obstacles is essential to improve the quality of the education sector – and of specific educational establishments. Are pedagogical and administrative practices changing in the expected direction? Do educational institution have a positive innovation culture that supports innovation? What are the drivers of innovation that policy makers or institution leaders could influence to achieve the systems' educational objectives? How much do countries invest in educational research?

This book proposes insights and tools to policy makers and education leaders willing to drive change based on data and evidence and new tools and methodologies for education policy makers and institution leaders to answer those questions. Based on the research literature and the long experience of innovation and research surveys, these tools are meant either for a statistical collection or to engage in self-reflection at the institutional level. Three aspects of innovation are covered: educational innovation at the system level, innovation culture within educational institutions, innovation towards equity in education. A questionnaire to measure educational research and experimental development expenditures and implementation and new methodologies to measure certain aspects of educational innovation and educational research based on big data and bibliometrics are also presented.

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