

**DIRECTORATE FOR EDUCATION AND SKILLS
EDUCATION POLICY COMMITTEE**

Education and Skills 2030: Curriculum analysis

Preliminary findings from an international literature review on “ensuring equity and innovations”

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This draft paper “Ensuring equity and opportunities to learn in curriculum reform” has been drafted by Prof. Joke Voogt, University of Amsterdam; Nienke Nieveen, Eindhoven University of Technology, Netherlands Institute for Curriculum Development, and Annette Thijs, Netherlands Institute for Curriculum Development. This draft was prepared to support the discussion at the 7th IWG meeting of the Education 2030 project. It will be finalised after the meeting, incorporating the comments during and after the meeting.

The participants are invited to:

- NOTE the preliminary findings of the literature review and
- COMMENT on the draft during the meeting or after the meeting by 22 May 2018.

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Ensuring equity and opportunities to learn in curriculum reform

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1. Introduction

This literature review is part of the International Curriculum Analysis, which is part of the Future of Education and Skills: the OECD Education 2030 project. The major purpose of the OECD Education 2030 project is “to develop a common language and shared space within which countries could both individually and collectively, explore issues around the design of instructional systems” (EDU/EDPC (2016)6, p.2).

The literature review aims to provide a better understanding of the relationship between characteristics of curriculum innovations and factors that influence equity and equal opportunities for students to learn. Equity and equal opportunities to learn are a major concern of educational and curriculum policy makers. In this study, we will review literature on characteristics of curriculum innovations that contribute to or hinder equity and equal opportunities to learn.

The overall research question for the review is:

What characteristics of curriculum innovations contribute to or hinder equity and opportunities to learn and how do jurisdictions cope with equity and opportunities to learn in the context of curriculum innovations?

In the review, we will examine how equity and opportunities to learn are related to curriculum innovations in jurisdictions. The review will focus both on how curriculum innovations can contribute to equity and opportunities to learn, as well as on curriculum innovations which can hinder equity and opportunities to learn. In particular, we aim to develop a conceptual framework that helps to discuss equity and opportunities to learn in relation to the quality and relevance of the curriculum. The education system is considered as the context in which the curriculum functions and develops, often in negotiation with different stakeholders. Education systems may have different effects on how characteristics of curriculum innovations and reforms contribute to equity and opportunities to learn.

2. Core terms in this review

Curriculum (based on OECD glossary): Curriculum is a political, policy and technical agreement among the various institutions and stakeholders, from both inside and outside the education system, on why, what, how, when and where to educate and learn. In this review, we refer to the curriculum at the level of: national/state (jurisdiction), school/district and classroom level. We limit ourselves to the curriculum for K-12 (ages 5 - 18). The curriculum is a key agent of the educational policy that contributes to the realization of the type of society pursued. It entails a series of planned teaching and learning experiences. A curriculum should have quality (that is e.g. rigor, focus and coherence) and be relevant for learners. A curriculum can have different manifestations: the intended, implemented and attained curriculum.

Curriculum innovation (or reform or renewal) (based on OECD glossary): Minor or major modifications of the curriculum to improve or adapt it to new circumstances or priorities. Curriculum innovation can be small changes that bring new approaches and solutions; and large scale, system-wide reforms that entirely reshape the existing curriculum.

Education system: The education system describes how education in a jurisdiction is organized. It refers to the way students go through the system and the way the curriculum, assessment and accountability system are regulated.

Curriculum (de-)regulation: Curriculum regulation refers to governing education through *directives at input* (e.g. attainment goals, standards) *and output level* (e.g. national exams, standardized tests, inspectorate), leading to limited room for curriculum decision making at the school level. Curriculum deregulation reflects governing education by staying away from control at the input and output level and giving room for curriculum decision making at school level (Kuipers, Nieveen & Berkvens, 2013).

Equity and opportunity to learn (based on Field, Kuczera & Pont, 2008; Armstrong, 2016):

Equity: Equity ensures that *all* students have opportunities to access a quality curriculum to reach at least a basic level of knowledge and skills and that the curriculum does not set barriers or lower expectations due to social economic status, gender, ethnic origin or location.

Opportunity to learn: Opportunity to learn ensures that the curriculum supports *all students* to realize their full potential. Opportunity to learn refers to the way curriculum is organized to provide maximum opportunity for all learners to develop their talents and reach their potential.

3. Method

Search strategy

This study used the following approach to find the relevant literature:

1. We used the snowball method and our network to find relevant descriptive and evaluative studies from a variety of jurisdictions.
2. We used findings from the two previous reviews for the OECD2030 project that addressed equity and opportunity to learn¹ to discuss the findings found in this review. Moreover, we searched for additional studies that cite the studies reported in the previous reviews to substantiate findings.

The following criteria have been used for inclusion of the collected studies in the review:

- Focus on initiatives related to equity and opportunity to learn in the (intended, implemented and attained) curriculum;
- Variation of countries/jurisdictions based on different education systems;
- Published after 2005;
- Literature reviews;
- Empirical studies of adequate quality: evaluation studies; descriptive studies (quantitative and qualitative);
- Publications accessible by the research team;

¹ Voogt, J., Nieveen, N., Sligte, H. Lemmens, A. (2016). E2030 *Curriculum analysis: Literature review on the impact Study*. (EDU/EDPC/RD(2016)39);

Bron, J., Nieveen, N. & Voogt, J. (2017). *Student voice in curriculum development* (EDU/EDPC(2017)16/ANN3)

Voogt, J., van de Oudeweetering, K. & Sligte, H. (2017). *Technology in Education: Effects, affordances and conditions for effective implementation: A review of recent literature*.

Data set²

First, the abstracts/executive summaries have been screened to examine whether the studies meet the inclusion criteria. Next, the remaining full articles have been screened with the aim to decide whether or not the article will be included in the in-depth review. This resulted in twenty-seven articles that were included in the dataset. The distribution in type of publication and year of publication are presented in Tables 1 and 2. The following jurisdictions are included in the study: Finland, Hungary, India, Japan, Korea, Scotland, Singapore, Sweden, Netherlands, New Zealand, Norway, USA.

Table 1: Type of publications

Type of publication	Number
Position paper	3
Review study	2
Report	3
Book chapter	9
Peer-reviewed scientific articles	10

Table 2: Year of publications

Year of publication	Number
>= 2015	17
2011-2014	4
=< 2010	6

Analysis

The studies were summarized using a template, which captured the following information: background information (author(s), date of publication, title); purpose/research questions guiding the study; country/jurisdiction; research design; description of the initiative; owner of the initiative; focus of the initiative; level of control; context (including regulation/deregulation); main outcomes; challenges (for intended, implemented and attained curriculum). The summaries were used to synthesize the findings of the studies. When necessary we went back to the original publication.

² This is the situation on 23022018 (might change)

3. Towards a conceptual framework

Equity and *Opportunity to learn* in relation to curriculum innovations can be linked with different curriculum goals and levels as a consequence of the different stakeholders who are in control. Ensuring equity aims at the improvement of students' performance to at least a minimum level. Ensuring opportunity to learn targets developing and enriching students' potential. We assume that these two concepts are not always easy to distinguish and are sometimes also corresponding to each other in educational practice.

Policy measures aiming to contribute to the realization of equity and opportunity to learn can have different forms, at micro, meso or macro level. For instance, the Educational Council of the Netherlands (2007) suggested several possible measures, such as extra curriculum time, extra curriculum content and more focused teaching, to prevent under-performance. These measures manifest themselves in different ways when implemented in the classroom, the school/district or at the level of a state and imply that at the different levels different stakeholders are in charge. Cornelisz and van Halem (2016)(ID21) propose four levels of control: the student, the teacher, the school principal/superintendent/school board and government. The authority granted to each of these four levels of control may differ with respect to proposed and implemented policy and initiatives. We agree with Cornelisz and van Halem (2016) that these four levels may not be found in its pure form in educational practice, but as a mixture of these levels. Using the four levels of control in this study helps to clarify opportunities and responsibilities of each level in contributing to equity and opportunity to learn in education, without ignoring interdependencies and joint responsibilities. We limited ourselves to three levels: 1. government, 2. schools and teachers and 3. students and analyzed the initiatives and policy (including outcomes and challenges) using level of control (government, school/teacher and student) to organize the findings.

Moreover, gaps may exist between the intended, implemented and attained curriculum at all three levels. Hence, it is important to recognize the curriculum representations that are indicated in the publications.

This leads to the following framework for analyzing curriculum innovations in relation to equity and opportunities to learn:

	intended	implemented	attained
government			
school/teachers			
student			

4. Results

First, we provide a general overview of the findings. In the remaining part of this section, we will describe the main outcomes and challenges of the initiatives and policies that aim to ensure equity and/or opportunities to learn. We will organize the initiatives and policies by level of control.

4.1 General overview of the results

Table 3 gives an overview of the number of publications in the dataset that address different levels of control related to equity, opportunities to learn or both. Eight publications reported on policy initiatives related to equity, eleven publications referred to opportunities to learn and eleven publications addressed both equity and opportunities to learn. Most publications (16) describe initiatives under control of governments, nine publications report initiatives at the school/teacher level and in five publications students are (to some extent) in control of their learning.

Table 3: Number of studies addressing levels of control vs equity/opportunities to learn (or both)

	equity	opportunity to learn	both
government	7	6	3
school/ teacher	1	1	7
student	-	4	1

Table 4 shows how the publications in the dataset are distributed across levels of control and curriculum representations. Most publications in our dataset (23) referred to policy initiatives at the intended level, followed by fifteen publications that addressed the implementation of policy and only five publications addressed the effects specific initiatives had on students.

Table 4: Number of studies addressing levels of control vs curriculum representations

Curriculum representations	intended	implemented	attained
Levels of control			
government	14	6	1
school/teachers	5	5	3
student	4	4	1

4.2. Main outcomes

4.2.1 Government in control

Our dataset contains several examples of educational policy at the national or state level that aim to contribute to equity and opportunities to learn. Most of these publications refer to the intended curriculum. Implementation (implemented curriculum) and results (attained curriculum) of these policies were hardly reported. The publications in the dataset address three main policy strategies that aim to contribute to equity and/or opportunities to learn: policies aimed at ensuring conditions for equity, policies aimed at realizing equity – in particular for students from disadvantaged backgrounds - and policies aimed at contributing to opportunities for realization of each student's potential.

Ensuring conditions for equity: meeting basic needs

The main concern of education, in a country with problems related to poverty such as *Hungary*, is to provide a basic level of education for all students (Szabó & Varga, 2017 (ID08)). Several measures are taken to decrease the effect of poverty on student learning: the provisions of free school meals (to 60% of the student population) and free textbooks (to 67% of primary and secondary school children) as well as full-day school instead of half-day school. School facilities in less developed areas are improved. These measures are considered important prerequisites for improving teaching and learning. To better prepare students for the workforce (there is a particularly big need in STEM related careers), schools and teachers are supported in developing a more student-centered and competency-oriented teaching approach.

Opportunities aimed at realizing equity

Mukhopadhyay and Sriprakash (2013) (ID42) studied how equity and quality schooling were linked to each other in policy discourses aimed at achieving Education for All. Their main concern is a narrow interpretation of quality (mainly based on numbers) and as a result a quantification of equity. They analyzed two remedial programs in the state of Karnataka in India. The Bridging program aimed to provide remedial teaching for out-of-school students; the Remedial teaching program aimed at serving primary school children with low achievement results. Mukhopadhyay and Sriprakash (2013) showed that ambitions of the state resulted in top-down targets and the need to show performance also to international contributors. Local contexts and needs were disregarded and the expertise of teachers and school principals ignored, resulting in resistance towards the proposed change. They claimed that such target-driven reforms might not contribute to equity and inclusion. They recommended a more comprehensive approach in which many stakeholders actively participated. An example of a more comprehensive approach was reported in Voogt et al. (2016) for the OECD2030 project³. In this study Raj, Sen, Annigeri, Kulkarni and Revankar (2015) evaluated a large-scale survey which studied the effects of a child-centered curriculum reform (Nali Kali – joyful learning) on student learning outcomes in primary government schools in Karnataka. The curriculum aimed at fostering creativity and experimentation in students' learning processes as well as changing the traditional hierarchy between students and teachers. Teachers were well supported in their

³ Voogt, J., Nieveen, N., Sligte, H. Lemmens, A. (2016). E2030 *Curriculum analysis: Literature review on the impact Study*. (EDU/EDPC/RD(2016)39); see par 37 (p. 10) and par 52 (p. 13)

teaching of the curriculum and each school involved in the project was trained. Results showed positive effects on student performance in mother tongue and mathematics.

In *Japan* there is an historic tradition of not recognizing ethnic schools. The recognition of high school diplomas from ethnic high schools thus was a big change, which contributed to equity of ethnic minority students in Japan (Tokunaga & Douthirt-Cohen (2012) (ID 47) and offered opportunities for further education to these ethnic minorities. The study provided insights on how this policy, in the context of a highly centralized policy-making culture, could be realized. Four strategies were aligned: 1. a variety of actions of non-governmental actors who protested against a first draft of the policy; 2. these actors used the opportunity given to them to critique the first draft of the policy when it was published; 3. careful use of language to problematize the draft, and value and frame the policy; and 4. also when policy is often a top-down process, the incremental development of the policy allowed for feedback loops resulting in formulations that were widely accepted.

Due to the wide gap between high and low achievers on international assessments in *New Zealand*, Wilson, Madjar and McNaughton (2016) (ID55) studied how opportunity to learn affected the reading ability of students with a low SES background, including indigenous and immigrant children. Opportunity to learn in this study concerns quality exposure to content (and thus related to the definition of equity in this review). Development of reading skills is considered important to qualify for further education. The study focused on schools with many students of indigenous, immigrant and low SES background. Findings showed that at the system level, the indigenous, immigrant and low SES students were less likely to be exposed to programs that helped them prepare for reading standards that allow for qualifying for further education. Also, at classroom level, these students were exposed to teacher-directed teaching focusing on less challenging texts which led to low level learning. New Zealand has a decentralized educational system, which gives schools and teachers ample flexibility in what and how they teach. As a result, close collaboration with schools and teachers was needed to overcome the inequity that was found (see par. 4.4).

An important aspect of the *Curriculum for Excellence in Scotland* (McManus & McAra (2016) (ID02) is the Scottish Attainment Challenge launched in 2015. It is a national program aimed at achieving equity by closing the gap in student achievement of children living in deprived (socio economic) communities in *Scotland*, with a particular focus on numeracy, literacy and well-being. As well-being (in addition to numeracy and literacy) was important for students' progress in learning it was deliberately planned as a core component of the Scottish curriculum (Hargreaves, 2017) (ID03). According to Hargreaves (2017) "Reducing the poverty-related health and education gap between people in Scotland's most deprived and most affluent communities remains as one of our greatest challenges" (p. 181). The approach aims to empower schools to maximize their impact on closing the gap. For this initiative, schools can develop their own strategies to attune to local needs by focusing on a whole community approach (Hargreaves, 2017). Schools get support from attainment advisors and local authorities. School self-evaluation is seen as an important vehicle in the process of empowering schools in this regard. Attainment advisors also monitor progress but measuring progress (in particularly related to well-being) remains a challenge. Results on the implementation and effects of the Attainment Challenge are not yet available.

Freedom of education is deeply rooted in the *Dutch educational system*. The government has some control to assure the quality of education via core objectives, national exams and the inspectorate but schools have the freedom to organize education. Within this context, schools have to offer education to all students, including students with special needs. Teachers are supposed to differentiate instruction to accommodate the needs of different students (van der Vegt et al. (2015) (ID53). A main problem of the system related to equity is the early tracking of students in the transition from primary to secondary education (Thijs & Berkvens, 2016) (ID05). Relatively many students with low SES or immigrant backgrounds are in the lower tracks, which often offer less challenging content and less difficult tasks, resulting in fewer opportunities for students in these tracks to develop their potential. A broad coalition of all stakeholders is formed to join forces to overcome the problems with early tracking, which resulted in measures related to increasing flexibility in the exam system (such as the possibility to take exams at higher levels). Obviously, equity and opportunities to learn are also important issues in the curriculum reform currently taking place in The Netherlands. More attention for personal development was one reason for this reform. In particular, the opportunity to reach one's full potential is associated with personal development, which calls for personalization of the curriculum and talent development (Visser, Houkema, Thijs & Zijlstra, 2017 (ID2017). Schools are responding to this call in their own way (Visser et al., 2017) (van der Vegt et al. 2015) (ID 053) and increasing expertise at school and teacher level is seen as an important condition for proper implementation (the Educational Council of the Netherlands, 2007) (ID43).

Opportunities for realizing student potential (opportunity to learn)

Bjørnsrud and Nilson (2011) (ID56) describe how three subsequent curriculum reforms in *Norway* (M87, L97 and K06) give room for interpretations of teachers and schools related to adapted teaching and inclusive education in the context of a comprehensive school system. Declining student achievement on international assessments was an important reason for the curriculum reforms in Norway. Adapted teaching aims at realizing differentiated education for students with different abilities and needs and is thus related to opportunities to learn. Inclusive education aims at quality education for all students, including students with special needs and thus relates to equity. The three curriculum reforms show how the equilibrium between government control and decentralization of responsibility to local communities shifted from a decentralized curriculum in 1987 (M87), to a more centralized controlled curriculum in 1996 (L97) (with standards as its main form of control) and a more balanced approach in 2006 (K06) (with emphasis on national evaluation of competences). The analysis showed that adaptive teaching had a strong mandate from M87 onwards, but that realizing adaptive teaching in the context of curriculum standards (L097) and evaluation and control (K06) mitigated schools and local communities' teachers in their interpretation of adapted teaching. While in M87 inclusive education was focused on integration, this shifted to inclusive education in L097 and K06 with a focus on the individual competence development of all learners. In this sense adaptive teaching and inclusive education became much more interwoven.

Developing student potential through their active participation

Sweden and Finland have educational systems that provide much room to local communities and schools to realize quality education. In both countries, students' active involvement in their learning is a core characteristic of the system and is strongly associated with equity and opportunities to learn. The rational benefits and organization of students' active participation in curriculum is also

described in the contribution of Bron et al. (2016) for Education 2030⁴. Recent curriculum reforms in Sweden have taken place because of declining academic performance on international assessments. However, there is a strong shared understanding that the debate about such reforms, in particular the implications at the school level, should not only be informed by government mandates and professional expertise but also by students and their experiences (Alerby & Bergmark, 2016)(ID07). Students' active involvement in decision-making and their learning is seen as a major way in achieving equity. Alerby and Bergmark (2017) argue that students' involvement in decision-making contributes to life skills (e.g. feeling responsible, communication skills, leadership qualities) and results in self-esteem, and the development of knowledge about democracy and society, which are also important for achieving equity. For this reason, active student participation is core to the Swedish educational system. The national core curriculum is an important instrument in the *Finnish educational system* in achieving equity. Vitikka, Holappa and Kauppinen (2016) (ID06) add that support and guidance for each student's learning path is an integral part of the Finnish education system. It is closely aligned with caring for student welfare. Niemi and Isophala-Bouret (2015) (ID54) clarify that equity is closely aligned with principles of lifelong learning that are core objectives of the curriculum. These principles focus on learning to learn, increasing responsibility for one's own learning and personal growth. Because of a focus on high quality teachers, who design their own teaching and are part of a culture of evaluation and evidence-informed practice and active in professional networking, Finnish teachers are prepared to contribute to achieving these principles in their students. In many schools, teachers implement learner-centred and process-oriented assessment practices, which help students to understand the learning objectives, develop a positive self-image, trust their potential and take responsibility for their achievements (Vitikka et al. (2016). However, there are still challenges to overcome and they are mainly related to the different achievements between boys and girls, the wide variations between schools in big cities (related to socio economic background) as well as the declining performance in mathematics and reading (Vitikka et al. (2016). Niemi and Isophala-Bouret (2015) report that future teachers like to be better prepared now since schools have become more heterogeneous and multicultural.

4.2.2. Schools and teachers in control

In this section we describe publications in our dataset that refer to explanations for (in-)equity and (less) opportunity to learn at the school and teacher level. Two major types of explanations are described: curriculum quality (program/materials) and differentiation (by teachers/schools).

Quality curriculum

Several studies in our dataset point to the importance of offering a quality curriculum to students from a lower SES background in order to provide students with quality learning experiences. Characteristics of such a quality curriculum at the school and classroom level are presented in this section. Similar findings as described in this section were also found in a previous review for Education 2030, see Voogt et al. (2013)⁵. Schiller, Schmidt, Muller and Houang (2010) (ID 48) studied how ethnic minorities and students from low-income backgrounds are disadvantaged in curriculum content offered in the courses in which they enroll and thus are offered a lower quality curriculum. Their study is situated in the context of the common core curriculum in the US and concerns the

⁴ Bron, J., Nieveen, N. & Voogt, J. (2017). *Student voice in curriculum development* (EDU/EDPC(2017)16/ANN3)

⁵ Voogt, J., Nieveen, N., Sligte, H. Lemmens, A. (2016). *E2030 Curriculum analysis: Literature review on the impact Study*. (EDU/EDPC/RD(2016)39); In particular see paragraph 45, page 12.

secondary mathematics curriculum in particular. They examined differences in the curriculum content that was offered to students first enrolled in Algebra 1 in terms of amount of instructional material (the size of the textbook) and the extent to which the material was cognitively challenging. They found that across courses the curriculum content offered through the materials to lower track students had lower quality, which could imply that lower track students get fewer opportunities to engage in cognitively challenging curriculum materials, than higher track students. They concluded that the curriculum materials thus created fewer opportunities for quality learning experiences and that this results in a self-fulfilling prophecy of low expectations for low income and minority students. A limitation of the study is that only curriculum materials were analyzed and not teachers' actual teaching. The authors conclude that schools need to carefully select curriculum materials that allow for quality learning experiences that are cognitively challenging. The result of this study aligns with findings from Clothfleder, Clotfelder, Ladd and Vigdor (2014) who found that early offering of Algebra as such is not beneficial for low performing students, but that the quality of the learning experiences (materials and teaching) matters. Also the study of Fenninger (2015) points to the importance of providing students, from underprivileged immigrant backgrounds, opportunities to study in challenging contexts⁶.

Thadani, Cook, Griffis, Wise and Blakey (2010) (ID48) argue that curriculum-based science inquiry interventions show potential in addressing equity in education, because they offer a high quality curriculum. Their study took place in the USA and focused on how such curricula were implemented in schools serving students from lower and higher SES backgrounds. Three schools (8 teachers, 177 students) were involved in their study. The schools differed in the number of low income and minority children they were serving. In each school, students from the intervention classrooms and control classrooms participated in the research. In the intervention classrooms students were exposed to the main features of science inquiry. Students were considered knowledge constructors and critics. Findings showed that the intervention benefitted low income/minority students relatively more than other students. Intervention classrooms showed more features of science inquiry than the control classroom, but the greatest difference was between the students in the control classroom and the intervention classroom in the school with most low income/minority students. Intervention students made greater gains in their learning from pre- to post, in particular, in the schools serving lower income/minority students. According to Thadani et al. (2010) such curricula contribute to equity because they offer more engaging and demanding learning experiences and they empower students. Thadani et al. (2010) emphasized the importance of teacher support (curricular materials, teacher training) in implementing science inquiry curricula, because of the (often) major differences with the normal routines of many teachers. Hand et al. (2013) (science) and Carroll (1997) (mathematics) report similar findings. Also Song, Fong and Looi (2012) (ID40) describe the potential of science inquiry curricula (in their case embedded in a mobile learning environment) to engage students in their learning. Their study is further described in section 4.2.3, as they emphasize the potential of personalizing learning with the help of digital tools.

Low reading levels of low income, minority and immigrant students in New Zealand are a major barrier for their further education (see also par. 4.2.1). Because of this, Jesson, McNaughton and

⁶ Voogt, J., Nieveen, N., Sligte, H. Lemmens, A. (2016). E2030 *Curriculum analysis: Literature review on the impact Study*. (EDU/EDPC/RD(2016)39); See resp. paragraph 46 and 44, page 12.

Wilson (2015) (ID57) closely collaborated with schools and teachers in a research-school partnership in developing an initiative to raise quality learning in literacy (i.e. reading and writing) using digital tools (such as netbooks for each student and blogs applications) to reduce the achievement gap and improve literacy levels of these students. There were about 1200 students who participated in this initiative. The intervention aimed at exposing students to challenging reading and writing tasks instead of the less challenging tasks that they usually received. Core activities in this research-partnership were collaborative design, peer learning and formative evaluation. Through the research-school partnership, teachers' expertise in change efforts was recognized, which was important in the implementation of the designed intervention. First results of this initiative showed increased progress in writing, but not yet in reading. The effect was maintained in 60% of the classrooms after the implementation year. Schools participating in the collaboration scaled the initiative to other classrooms.

According to Cornelisz and van Halem (2016) (ID21) differentiation distinguishes between convergent differentiation and divergent differentiation. Convergent differentiation aims at having all students achieving at least a minimum educational level and is associated with equity. Divergent differentiation aims at providing students with opportunities to realize their own learning goals and this relates to opportunity to learn. Volman and Stikkelman (2016) (ID 22) conducted a literature review on the effects of *convergent differentiation*. Studies about the effects of convergent differentiation are particularly found in primary education. The review found evidence from meta-analyses that convergent differentiation in combination with learning in small groups and adaptive instructions resulted in positive effects. Findings further showed that homogenous ability grouping within classrooms positively affected the higher ability students, but negatively affected the lower ability students. Homogeneous grouping is also negative for the social emotional development of low ability students. A more dynamic form of differentiation described in the review focused on scaffolding, which was attuned to students' needs. This form of differentiation resulted in improved literacy results in mixed ability classrooms and took away the influence of parents' educational level on student outcomes. Differentiation in the form of adaptive instruction combined with enrichment activities also resulted in positive effects on reading, but not on motivation to read. Volman and Stikkelman (2016) also reported that the technology-related initiatives that used learning analytics to inform teachers about their students' achievement (sometimes) provided them with suggestions to organize adapted instructions to support teachers. Preliminary findings suggested that when teachers were well prepared to act upon the information provided to them in a pedagogically sound and effective way, this use of technology improved teaching and student achievement.

In their review, Volman and Stikkelman (2016) found that meta-analyses showed that *divergent differentiation* often had a positive effect on students with higher abilities in realizing their potential than students with lower abilities. Cornelisz and van Halem (2016) (ID 21) also reported that divergent differentiation in curriculum offerings to students might lead to undesirable differences between schools, resulting in increased gaps between students from affluent backgrounds and students from impoverished backgrounds.

Many primary and secondary schools in the Netherlands offer extra-curricular activities aimed at performance improvement (e.g. extra curriculum time, homework support) and enrichment (e.g. schools with specific profiles –STEM, art, sport; classes for gifted students) (the Educational Council of the Netherlands, 2010; Van der Vegt et al. 2015) (ID53). Such activities may contribute to

students' personal development, engagement and self-confidence if they are of quality and not incidental (the Educational Council of the Netherlands, 2010). The Minister of Education and Culture has asked for advice to inform future policy about the government's and school's responsibility concerning the personalization and flexibility of the curriculum (the Educational Council of the Netherlands, 2010, 2017, van der Vegt et al., 2015) (ID44) (ID20) (ID53).

We also found forms of divergent differentiation in a study about mathematics teaching in Korea by Kang and Hong (2008) (ID31). In order to explain the big achievement gap in mathematics between students with high and low SES backgrounds in Korea, Kang and Hong (2008) found that (compared to the US) Korean students spent more time to learn mathematics outside school through remedial and enrichment programs offered by the school or through private instruction. In particular the latter, private instruction was not within the reach of low SES students, which might contribute to the observed achievement gap.

4.2.3 Students in control

In our dataset several initiatives aimed at providing students (some) control of their own learning. These initiatives often use personalized learning as an overarching concept. The teacher is mostly in control in convergent differentiation. However, students are (to some extent) in control in personalized learning settings where there is divergent differentiation in the school. Although personalized learning has many definitions and connotations (Maguire, Ball & Braun, 2013), it has as its main purpose to contribute to the development of students' potential (*opportunity to learn*).

Volman and Stikkelman (2016) (ID22) found in their review of the literature technology-related initiatives in the form of intelligent tutoring systems, that aim to adapt instruction to the students' ability or interest. Although many of these initiatives, strictly spoken, are not student-led but technology-led, they are often presented as forms of personalized learning. Findings showed that such use of technology might improve student achievement. These findings were aligned with findings in the review by Voogt et al. (2017) conducted for the OECD2030 project about the impact of technology on education. In this study, we found that technology could contribute positively to the learning of low achieving students, students from low SES backgrounds, students from rural settings, students from developing countries and students with disabilities, because of the possibilities of technology to adapt to the needs (to realize equity) and interests of students (to contribute to opportunity to learn).

Pane, Steiner, Baird, Hamilton & Pane (2017) (ID23) provided insights in the implementation and effects of personalized learning in 40 primary and secondary schools in the USA serving large proportions of minority students or students with low SES background. The definition of personalized learning adopted in this initiative is "Personalized learning prioritizes a clear understanding of the needs and goals of each individual student and the tailoring of instruction to address those needs and goals. These needs and goals, and progress toward meeting them, are highly visible and easily accessible to teachers as well as students and their families, are frequently discussed" (Pane et al., 2017, p. 6). Four strategies were applied to enact personalized learning in practice. *Learner profiles* consisting of up to date data on each student's strengths, needs, motivations and progress) inform the educational plan. Within parameters set by teachers, *personal learning paths* allow students to

make choices in what they learn or on how they learn. *Competency-based progression* monitors student progress towards defined goals. Assessment takes place just in time and *flexible learning environments* that are designed to support personalized learning. Initial findings suggested that students seem to benefit from the approach; positive performance effects were found on students' mathematics and reading skills (only the findings for mathematics were significant). However, effects differed across schools and teachers found it difficult to implement the aspects of the change that challenge their teaching role most. Implementation challenges were related to meeting grade level standards when students' pace was slow, the time needed to develop personalized lessons, in particular related to finding high quality technology-based materials, and the poor integration of data-systems to inform learner profiles. The researchers argued that schools needed time to implement personalised learning. Further research is required to better understand the effects of student performance.

Song, Fong and Looi (2012) (ID40) described how personalized learning was fostered in a primary science-inquiry curriculum in Singapore using mobile technologies. This study helps to understand how to scaffold student personal learning. Personalized learning in this small-scale study (only one primary school was involved) was defined as "an approach tailored to the abilities, preferences, interests, and other diverse needs of the individual students. Thus, it empowers the students with more autonomy to develop their own learning paths and with more room for creativity, collaboration, content creation, multi-modal learning and problem-solving, and to become active, and responsible agents in the learning process" (Song et al., 2012, p. 681). In this study, there were two types of scaffoldings to guide students' learning: an experiential learning model and a mobile learning environment. The experiential learning model structured the learning process through a cyclical process of concrete experiences, reflection and testing, and the mobile learning environment provided tools to support the learning process, such as worksheets, websites and instructions. In addition, students had access to smartphones. Within a task set by the teacher, students could choose their own learning path, develop their own learning goals, set their own learning pace and keep track of their own portfolio. The study demonstrated that students developed agency for their own learning with the help of the two scaffolds. Findings showed that students made different use of the scaffolds offered to them and that this impacted the quality of their learning. Students who made full use of the scaffolds gained deeper conceptual understanding compared to students who used the scaffolds superficially or partly. Unfortunately, no information was provided on why some students made better use of the scaffolds than others.

A quite different initiative that offers students opportunities to realize their potential can be found in virtual schooling initiatives. Virtual schooling for secondary school students started as the virtual high school in several states of the US in the mid 1990s. The initiative initially aimed at providing affordable and accessible education to reach at risk students and students from deprived communities (Roblyer, 2008) (ID34). Since then virtual schooling for K-12 has become a global phenomenon (Ferdig & Davis, 2018) (ID 58) with millions of students worldwide participating in some way. Recent studies suggested that marginalized students indeed tend to enroll relatively more in virtual schools than other students (Davis & Ferdig, 2018). However, not all students are successful learners in this context. Successful students tend to be motivated and to have self-regulation and information technology skills. To be a successful learning experience for all students, quality support helping students to learn in a virtual schooling context is needed. This support needs to include

counseling. With K-12 students involved, virtual schooling initiatives also have to be aware of its pedagogical responsibilities. Parents have a role because students' learning takes place at home. Virtual schooling also affects teacher and administrator roles (Davis & Ferdig, 2018). While public education was the initiator of the virtual high school in the US, nowadays both profit (in particular in the US) and non-profit models for virtual schooling co-exist. Important issues related to the quality of virtual schooling experiences are teacher quality, financing models, accreditation and the societal value attached to diplomas and certificates (Roblyer, 2008).

5. Equity and Opportunity to learn and curriculum (de-)regulation

The initiatives and policies presented in this review show that characteristics of educational systems and the way the curriculum is regulated within these systems guide policy making and initiatives as well as the way in which schools and teachers (and in some instances students) shape the curriculum at the school and classroom level. Cornelisz and van Halem (2016) (ID21) reviewed the literature on how three policy instruments affect equity and opportunity to learn initiatives: legislation, the finance system, and quality monitoring and control.

Legislation determines how the educational system is regulated. It determines the room of the government and the schools to steer education, also with respect to equity and opportunity to learn. For example in the Netherlands, Van der Vegt et al. (2015b) (ID59) analyzed how legislation allows schools to have a flexible curriculum that provides students with opportunities to learn. Within a context where core objectives are to be strived after and outcomes are to be monitored, the legislation allows schools a great deal of freedom in how they organize education and offer students opportunities to learn. Schools in the Netherlands vary a lot in the way they use their freedom (the Educational Council of the Netherlands, 2010), and the government has only limited steering possibilities. Within the Dutch context negotiations between all stakeholders, leading to a shared vision and a widely supported plan of action is necessary for educational policy to be implemented. In another example, Japan, where ethnic high schools are accredited, shows how in regulated systems non-governmental actions are negotiated and result in national policy that contribute to equity (Tokunaga & Douthirt-Cohen, 2012). Access to high quality teachers for all students (also for marginalized students) is the result of a policy that sets high requirements for teachers in a regulated educational system as in Korea (Kang & Hong, 2008).

How the budget is allocated and who is in control are important financial parameters. Cornelisz and van Halem (2016) reported that charter schools in the US aimed at realizing personalized education felt hindered, because they lacked the authority to allocate financial means. In a deregulated educational system, such as the Netherlands, the majority of the budget is based on lump sum financing. It allows schools to set own priorities. In addition, specific policy initiatives from the government steer by money that is allocated to realizing the policy goals and schools have to justify the way they spend these additional funds. Similarly, the Scottish Attainment Challenge allocates money to local authorities as well as schools to develop their own strategies in closing the attainment gap (McManus & McAra, 2016). A voucher system may put learners in control of their learning, in particular in higher education. In the Netherlands, students with disabilities have been given vouchers, to organize the support they need to optimize their learning in the regular education system. In Hungary and India, the initiatives taken to assure quality education for all also depend on

international organizations, such as the European Union and NGOs (Non-governmental organisations). Personalized forms of learning are considered expensive because of the costs related to the technology infrastructure, industry and foundations (e.g. Pane et al., 2016) to support schools.

The Finnish educational system can be considered a deregulated system. Within the boundaries of a core curriculum, high quality requirements for teachers and commitment to self-evaluation of educational outcomes at school and community level, schools are held responsible for serving students in realizing their potential. The shared vision reflected in the core curriculum together with a high quality teaching force warrants the implementation of equity and opportunity to learn in educational practice (Niemi & Isophala-Bouret, 2015; Vitikka et al., 2016).

6. Conclusion

The literature review aimed to contribute to answering the following question: *“What characteristics of curriculum innovations contribute to or hinder equity and opportunity to learn and how do jurisdictions cope with equity and opportunity to learn in the context of curriculum innovations?”*

This review focused on studies that discussed research on the impact of curriculum innovations on equity and opportunity to learn. The studies were analyzed from the perspective of control of respectively governments, schools/teachers and students. The studies discuss equity/opportunity to learn from a curriculum perspective and not from a school effectiveness point of view. The findings of our study show that most publications addressed policy intentions of governments aimed to support equity and/or opportunity to learn. Fewer studies addressed the implemented curriculum and only a handful of studies (in particular under control of schools/teachers) referred to the attained curriculum.

The publications show how policy is formulated within the possibilities and constraints of the (local) educational system. The international discourse (e.g. on personalized learning and closing the achievement gap) informs the national discourse, but the system and the culture determine how the discourse is translated into policy. Rationales guiding curriculum reforms under control of governments were related to concerns about decreasing levels of student performance (often related to lower rankings in international assessments (e.g. Bjørnsrud and Nilson, 2011; Alerby & Bergmark, 2016), and deep concerns about (lack of) opportunities for all children in an increasingly complex society (e.g. (McManus & McAra, 2016; Szabó & Varga, 2017). In some policies, equity and opportunity to learn were closely related: improving the opportunities to learn was also seen as a solution to equity problems (e.g. Bjørnsrud & Nilson, 2011; Niemi & Isophala-Bouret, 2015; Visser et al., 2017). In several studies the importance of equal opportunities for students' personal development and well-being (beyond attention for numeracy and literacy) were considered as vital in realizing equity and opportunity to learn (e.g. Alerby & Bergmark, 2016; Hargreaves, 2017).

We found two types of initiatives under control of schools and teachers that relate to equity and opportunity to learn: offering a well-designed curriculum and differentiation. The first set of studies show that a curriculum that offers engaging and demanding learning experiences for disadvantaged students, empowers them and contributes to equity and opportunity to learn. Similar findings were also found in Voogt et al. (2016). The second set of studies shows the implications of differentiation

for equity and opportunity to learn. Convergent differentiation (aiming at having all students achieving at least a minimum educational level) has positive effects on learning when it is combined with adaptive instruction and small group learning. Technology, in particular learning analytics, can inform teachers about student performance, which helps teachers to adapt their instructions. However, capacity development for teachers is needed on how to use these new possibilities to optimize their teaching.

Homogeneous grouping within the classroom, as a specific form of convergent differentiation seems to have negative effects on low ability students but positive effects on high ability students. Homogeneous ability grouping thus negatively affects equity but contributes for higher ability students to reach their potential. Also, divergent differentiation benefits higher ability students more than lower ability students, which might result in increased achievement gaps. These negative effects are smaller when differentiation is embedded in a broader learning setting, including adaptive instruction and monitoring student progress. When differentiation leads to less challenging learning experiences lower ability students might not be able to reach their potential, as described earlier.

We found only a few studies that investigate (the organization of) personalized learning with students having some control of their learning. The findings of these studies show the potential and complexity of these forms of learning. The implementation of these initiatives requires quality materials, capable teachers and an up to date infrastructure (including data systems). In this set of studies, virtual schooling is an initiative attracting many students as a way to realize their potential and can be seen both as an opportunity and a threat for the public school system. More research on how this form of schooling impacts on equity is needed.

The review showed that levels of control cannot be completely distinguished. Governments depend on schools and teachers when innovations need to be implemented and students need teachers and schools to make personalized learning happen. Our review also shows that in educational practice equity and opportunity to learn are often not clearly defined and can be complementary to each other. Moreover, policy measures that aim at contributing to equity may result in an increase in the opportunities to learn for all students. And the other way around: we have found policies that focus on opportunities to learn that caused inequity for some groups of students.

7. Recommendations for policy and further research

Based on the findings of the review we formulate the following recommendations:

- *Policy development aimed at ensuring equity and opportunity to learn requires a systemic approach.*

Policy that targets curriculum innovations need to encourage concerted efforts and participation by many stakeholders. A combination of top down and bottom up initiatives are important for implementation in practice (Fullan, 2007). A shared vision and an action plan underlying the intended change are important for enactment in practice. Japan (accreditation of ethnic high schools - Tokunaga & Douthirt-Cohen, 2012) and Scotland (Scottish Attainment Challenge - McManus & McAra, 2016) provide examples of such systemic approaches.

- *Include well-being and personal development as important educational goals that are needed to ensure equity and opportunity to learn*

In several studies, equity and opportunity to learn were not limited to cognitive learning goals only. In particular at the level of national policies, attention for student well-being and personal development were mentioned as an important aspect of empowering students to get prepared for society. Students' active involvement in curriculum decision-making is a possible way to contribute to the empowerment and personal development of students and can be one way to contribute to such educational goals. Volman and Stikkelman (2016) indicate the need for more research in this domain.

- *Provide all (including marginalized) students with engaging and challenging learning experiences.*

Our review showed examples of the positive impact of engaging and challenging learning experiences for students from disadvantaged backgrounds. These examples show that quality curriculum experiences contribute to equity for disadvantaged students and to opportunity to learn for all students (e.g. Jesson et al., 2015; Thadani et al., 2010). Carefully monitored experiments on how to organize personalized learning within a quality curriculum are needed to find out how all students can be served in the best possible way.

- *Invest in the quality of teachers and school leaders by providing opportunities for continuous professional learning about equity and realizing students' potential*

Implementing curriculum reform in practice depends on teachers and school leaders. Their expertise is essential in ensuring equity and opportunity to learn. Several studies in the review (e.g. Thadani et al., 2010; Pane et al., 2017) show the importance of investing in the support of teachers via time, quality curriculum materials (including technology applications) and professional support. Similarly, school leaders need to become educational leaders to organize the processes that need to be in place (e.g. Pane et al., 2017).

- *Anticipate on development of profit-based models of schooling, such as virtual schooling*

How the public school system and virtual schooling relate to each other is to be seen and might need to be reinvented. New ways of collaboration as well as competitive models can emerge. How this will impact equity and opportunity to learn is not clear and this requires attention of policy-makers in curriculum reform contexts. Focused experiments that are closely monitored seem important in anticipating on further developments in this realm in the (near) future.

- *Investigate how to inform on minimum levels without providing the message that these are the minimum levels for all students*

Finally, we did not find any studies that report on how standards formulation (general, specific- e.g. for age level) and assessment (formative and/or summative) on the one hand inform schools and teachers about the minimum level that all students need to achieve, without schools restricting themselves to this minimum for all students. Further research in this area seems important for curriculum policy development at the national level that aims to contribute to equity and opportunity to learn.

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