ANALYTICAL FRAMEWORK FOR THE CONTEXTUAL DIMENSION OF THE AHELO FEASIBILITY STUDY

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Report of the Second Meeting of Experts on the AHELO Contextual Dimension

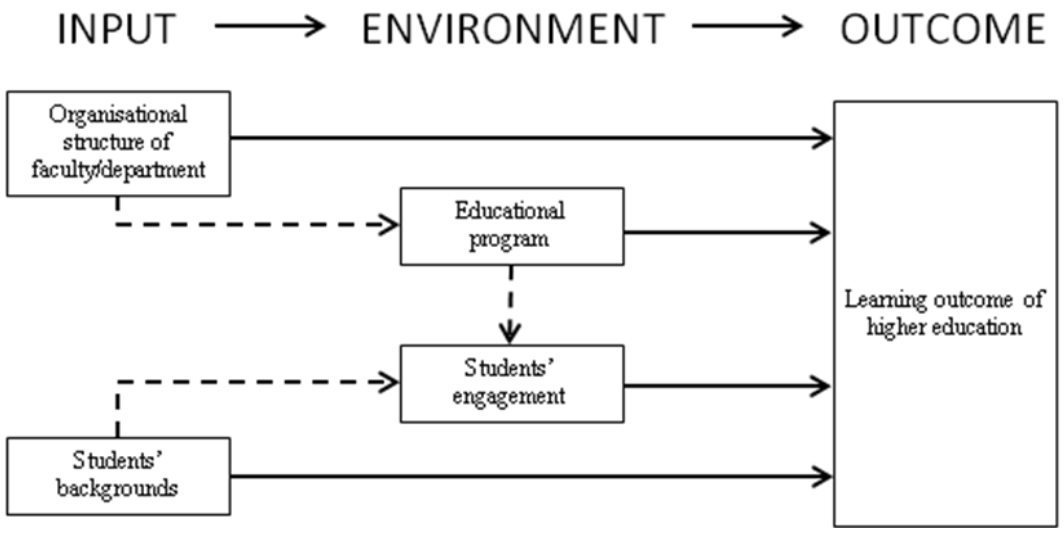
This report presents conclusions of the second meeting of an expert panel convened by the Organisation for Economic Cooperation and Development (OECD) to provide advice about the contents and construction of a Contextual Dimension to support the Feasibility Study for its Assessment of Higher Education Learning Outcomes (AHELO) initiative.[1] The panel's first report provided a basic rationale for collecting contextual data as an integral part of AHELO and provided an initial set of potential variables that might be collected through the Feasibility study. The panel's first report also proposed that data on these variables should be collected through existing documentary information and surveys administered to students, relevant teaching faculty, and programme/institutional academic leaders.

The panel held its second meeting on 23-24 February, 2009. The purposes of this meeting were to refine proposals for gathering contextual data in the AHELO Feasibility Study and to respond to requests made by the GNE during its meeting on 17-18 December 2008. Accordingly, the panel organized its work into four main tasks. First, in response to GNE questions about the immediate value of contextual data given the likelihood that insufficient student numbers will make it difficult to identify causal relationships between background factors and learning outcomes, the panel developed a fuller explanation of the need to collect contextual data as a part of the Feasibility Study. Second, to help clarify for the GNE the importance contextual data for AHELO's success, the panel developed a set of analytical questions to illustrate how contextual data can be used to address important policy issues for participating institutions and countries. Third, in response to GNE requests that the panel recommend ways to limit the potential burden associated with collecting contextual data, the panel developed a number of concrete strategies and approaches to address these concerns. Finally, the expert panel responded to the GNE's request that the panel work with the OECD Secretariat to produce for the next GNE meeting a proposal for prioritizing desirable contextual data. This methodology is provided in a separate document (EDU/IMHE/AHELO/GNE(2009)10). The current report is organized in three main sections corresponding to the first three topics.

The Importance of Contextual Data

The role that contextual data is intended to play in AHELO can best be described in terms of an Input-Environment-Outcome (I-E-O) model of learning outcomes (Astin 1978) as illustrated below:

[1] The expert panel comprised individuals whose experience and research backgrounds centered on the effects of learning environments and pedagogy on undergraduate student learning, and the organisation and governance of national higher education systems and higher education institutions (see Annex 1).



Under this model, student learning outcomes such as those assessed through AHELO are a joint product of input conditions and the environment within which learning takes place. Inputs can include student characteristics such as incoming abilities and demographic characteristics such as gender and socio-economic status, both of which have been shown by research to be related to learning (Pascarella and Terenzini 1991, 2005). Environment consists of the setting in which learning takes place (for example classrooms, on-line, in the workplace, etc.), the curricula and pedagogies that constitute the medium of instruction (for example, hierarchical course-taking, lecture-recitation, or problem-based learning), and student learning behaviours (for example, collaboration, active learning, or interaction with instructional staff). All three of these have been similarly related strongly to student learning outcomes through decades of empirical study (Pascarella and Terenzini 1991, 2005; Kuh 2008).

Collecting data about the learning environment within which learning takes place, as well as learning-related behaviours on the part of students who complete AHELO assessments, is important for the Feasibility Study for several reasons. First, there are important technical reasons why contextual data needs to be collected along with learning results in any large-scale operational assessment programme. For example, contextual information is essential during data cleaning and in the calculation of assessment scores—for example in checking the validity of obtained results in the light of particular student or programme characteristics or identifying biased cognitive assessment items for specific groups of students.[2] Experience with the Programme for International Student Assessment (PISA), for example, demonstrates that descriptive data about inputs and environments is indispensible in carrying out these necessary technical tasks. This will be true for AHELO as well.

A second important reason for collecting contextual data is that the scores that the planned assessments in generic skills, engineering, and economics will yield are likely to be compared across institutions and countries—if only to assess the feasibility of doing so. In the absence of data that describes important differences among these settings that are related to assessment performance, unintentional ranking might be the result. Ranking of this kind is the exact opposite of what AHELO is designed to accomplish and was a subject about which the GNE expressed concerns in its December meeting. In addition, questions will undoubtedly arise about how to interpret cases in which institutions that are very similar with respect to input or environmental characteristics but perform at very different levels on the

[2] For example, men may outperform women on a particular assessment task centered on football because of the prompt, not because of any difference in underlying knowledge or skill.

assessments, or the reverse. Finally, the panel wishes to point out that the importance of context is evident in the design of the AHELO Feasibility Study itself, in which participating countries are directed to select a wide variety of institutional types for participation. Such direction would not have been given by the OECD Secretariat absent significant concern that differences in context may influence performance and should be investigated through the Feasibility Study.

A third important reason to collect data about context is that without it nothing can be done by institutions or countries to improve learning outcomes. Policymakers and academic staff need to know which of the many input and environmental factors that can be changed are the most important in causing learning gain. This information will enable them to make the appropriate investments or take the necessary actions. Equally important, they need to know which contextual factors that are *not* amenable to policy action are related to learning so they can try to take advantage of these when they are encountered. Discovering and acting upon such researched relationships between learning outcomes and their causes is a primary objective of the AHELO initiative.

A final significant reason to collect contextual data is that important stakeholder groups see it as a critical component of AHELO. This was expressed at the AHELO Stakeholders' Consultative Group meeting in February 2009. Conversations at this meeting highlighted concerns from some stakeholders that AHELO could result in unwanted standardization if it does not properly take context into account. These concerns were particularly strong among representatives of institutions and faculties—stakeholders whose support will be critical to the implementation of AHELO. For example, a letter provided by Education International to the OECD Secretariat stated, "In our view...the contextual strand of AHELO is critical and we support the intention not to pursue this as a stand-alone effort. Without accounting for key contextual variables, the generic and discipline skills outcomes will be of little use and will be open to serious misinterpretation." The inclusion of contextual data in the Feasibility Study could provide a strong signal to stakeholders that their concerns are taken into account and might reassure them about the objectives of AHELO. This could enhance their acceptance of and advocacy for the initiative.

These are strong arguments that contextual data should be collected as part of AHELO. But there is a set of equally good reasons why collecting such data up front as part of the Feasibility Study is also a good idea. First, and most obviously, the feasibility of collecting the contextual data itself must also be tested. Although examining the institutional and student sampling frames and administering and scoring the cognitive assessments themselves remain the primary purpose of the Feasibility Study, attention will also need to be given to looking of the soundness of the arrangements for gathering data about inputs and environments. Any survey effort requires a pilot phase to refine questions and correct unanticipated problems. It makes little sense to delay these necessary try-outs until the operational phase of the programme if the decision has already been taken that contextual data will eventually be collected.

Just as important is the need to "rehearse" the kinds of analyses that are planned to uncover relationships between different combinations of input-environment factors and outcomes. Many of these analyses will take practice to devise, so are best undertaken at the feasibility stage. Finally, collecting a range of contextual data at the feasibility stage and exploring their utility will almost certainly reduce the number of contextual variables that will eventually have to be collected, because some of them will turn out to be redundant or not very useful for analysis. The overall result will be to reduce burden in the operational programme.

In light of all these factors, the panel of experts strongly recommends that contextual data be collected by all countries that participate in the AHELO Feasibility Study. The panel recognizes that burden is an important consideration and countries may vary in the amount of contextual data that they compile (see the section on "Reducing Burden" below). But absent any contextual data at all, participating countries will

find that they are unable to interpret the resulting outcomes information in a way that informs improvement and may endure ill-informed attempts to rank institutions or countries according to outcomes.

Analytical Questions and Associated Data

As argued in the first report of the panel of experts, deliberately posing a set of analytical questions is a critical pre-requisite for identifying the particular contextual variables that should be collected in AHELO. The preliminary list of potential data elements presented in the panel's first report was generated by just such a set of analytical questions. The purpose of this section of the panel's second report is to describe a few of these questions and the resulting analyses more fully in order to concretely demonstrate the utility of collecting contextual data. This discussion should also prove valuable to the GNE in informing the prioritisation exercise.

The examples provided in this section are designed to "rehearse" some of the most important applications of contextual data that may be undertaken in AHELO, and that should therefore be tested in the Feasibility Study. These examples are presented at three different levels of analysis (institution, programme, and student population) to demonstrate a range of different topics and applications. A fuller list of research and analytical questions produced by the panel of experts is provided in Annex 2.

Institutional Level of Analysis

Two examples were selected by the panel of experts to illustrate the use of contextual data at the institutional level of analysis.

- Impact of Admissions Selectivity and Student Mix on Outcomes. Past research has demonstrated repeatedly that the academic ability levels of entering undergraduate students is strongly related to tested learning outcomes.[3] Research has also suggested that different mixes of ability within a given student population may affect what and how much students learn.[4] This is a particularly important contextual question for AHELO because the intent is to sample student outcomes across the range of institutions that comprises each participating country's higher education system. If selectivity or student ability mix affects outcomes, differences in assessment results among institutions may be largely because of these ability factors and may not reflect differences in teaching effectiveness. Similarly, this is a set of questions that is important for policy. Should students of high ability be concentrated in the same institutions or should they be mixed with students of somewhat less ability in the hope that the latter will benefit?

  Investigating such questions would require contextual data about institutional characteristics such as size, type, enrollment characteristics, and admissions selectivity provided from institutional records, institutional leadership surveys, and faculty surveys. It may also benefit from contextual data provided by students on their perceived readiness for collegiate study and their motivation and self-confidence. Analyses associated with these types of question can be quite straightforward, beginning with tabular breakdowns of results by different levels of institutional admissions selectivity. At a more sophisticated level, they might include multivariate statistical analyses designed to determine the relative impact of selectivity controlling for other institutional characteristics.

[3] For example, see Pascarella *et al*. 2006; Pascarella and Terenzini 1991, 2005; Astin 1977.

[4] For example, see Kuh *et al*. 2005.

- Impact of Research Intensiveness on Student Outcomes.[5] A frequent debate in the academy centers on whether the emphasis that a university places on research benefits or inhibits undergraduate learning. Some researchers sees the trade-off between research and teaching as zero-sum, claiming that a heavy institutional research emphasis results in less faculty engagement in and reward for teaching, with lesser student learning being the result.[6] Others maintain the established view that engaging in research by its very nature yields more informed and effective teaching.[7] This question is also important for policymakers who must make important choices about how to improve undergraduate instruction—for example whether to concentrate research in institutes or conduct it in university settings.

  Contextual variables needed to address these questions include institutional characteristics such as the type and volume of research conducted or whether graduate study is offered. But perhaps the most important data elements include the perceptions of academic leaders and faculty about research emphasis, teaching culture, incentives for improving teaching, and prestige/international reputation. This research question might be further explored by a multi-staged inquiry into what kinds of teaching practices and student learning behaviours occur in research-intensive and teaching-intensive settings resulting, in turn, in improved student outcomes. Statistical analyses to examine these relationships could include multiple regression, hierarchical models, and path analysis.

Unit/Programme Level of Analysis

Two examples were also selected by the panel of experts to illustrate how contextual data can be used to address important questions at the academic unit or programme level.

- Balancing Subject Matter Knowledge and Generic Skills Development. Curricula in disciplines like economics and engineering have traditionally been organized in terms of disciplinary content knowledge. More recently, however, reforms have aimed at developing more integrative cross-cutting abilities within the discipline or profession such as application and problem solving.[8] Given these differences, an important question that AHELO could help answer is how differing emphases of these two philosophies in curricular design and pedagogy affect learning outcomes. Does an explicit orientation toward cross-cutting abilities foster better mastery of disciplinary knowledge as well as generic skills? Alternatively, are generic skills fostered naturally in the more traditional approach that emphasizes disciplinary content. Answers to such questions have considerable bearing on both national and institutional strategies for teaching and programme design in fields like economics and engineering.

  Contextual data needed to answer these questions include faculty and academic leader-reported information on curricular structure, expectations for teaching practices, the role of generic outcomes in the curriculum, orientation within the discipline and emphasis on applied work. Also relevant to this question are student self-reports on exposure to particular teaching practices.

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5 Relationships such as these have been shown to be important in PISA; for example, see Consell Superior d'Avaluacio del Sistema Educatiu (2008).

6 For example, see Marsh and Hattie (2002); Hattie and Marsh (1996); Fairweather 1996.

7 For example, Shuster and Finkelstein 2006; Bok 2006.

8 For example, the Accrediting Board for Engineering Technologies (ABET), which accredits engineering programmes in many countries, restructured its accreditation criteria around eleven generic "programme outcomes" a decade ago.

- Impact of Activity-Based Learning. In recent years, there has been a notable increase in the use of "activity-based" learning modalities in disciplines like engineering and applied economics and business programmes. Such approaches may involve the use of alternative instructional settings such as workplace placements or internships in which students learn by doing.[9] They may also include activity-based pedagogies delivered in more traditional university settings such as simulations or problem-based learning. Such alternative approaches are of significant policy interest because they often promise to deliver improved learning at reduced cost.[10] But there are many unknowns about whether using these approaches enhances student acquisition of content knowledge or whether they yield significantly better results on generic skills assessments. These approaches may also work better for some kinds of students than they do for others. Examining questions like these may also be important because results may demonstrate that equivalent learning outcomes can be obtained using quite different teaching/learning approaches, thus avoiding curricular standardization.

  Contextual data required to investigate these issues involves both instructional settings and student characteristics. Relevant variables include reports from programme leadership and faculty about emphasis on applied work, links between the programme and relevant industries and professions, and expectations for teaching practices. They also include reports from students about exposure to specific teaching/learning practices. Appropriate student characteristics to investigate contingent effects (i.e. whether such approaches work better for certain kinds of students) include demographics, enrollment characteristics, concurrent work experience, and self-reported preparedness for tertiary study.

Analyses designed to explore both these topics would require multivariate statistical approaches because of the many potential interrelationships involved—especially if differential impacts on different types of students are of interest. Because of this potential complexity, as well as unknowns about the actual properties and usefulness of the contextual variables required, it would be advisable to try out some of these analyses in the Feasibility Study.

Analyses Involving Groups of Students

Examining differences in assessed learning outcomes for different kinds of students and for students engaging in different kinds of learning experiences would probably be among the most important class of analyses that AHELO will enable. Among the many potential analyses in this category, the panel of experts chose three for purposes of illustration.

- Impacts on Different Demographic Groups of Students. Both population mobility and changing participation rates in tertiary study are affecting the demographic profile of students in many countries. These shifts in student characteristics raise important questions about whether generic or professional/discipline learning outcomes vary significantly across populations with respect to such factors as age, gender, underserved or disadvantaged groups, or socio-economic status. Disaggregation of assessed learning outcomes by these variables would be among the most straightforward analyses that the Feasibility Study might try out.

- Barriers to Learning. Similarly, as participation rates in tertiary study continue to rise, student populations not accustomed to collegiate study will be included. "First generation" students such as these typically bring with them a range of less tangible barriers to effective learning such as

[9] See for example, Kuh 2008; Tagg 2003; Harvey and Knight 1996.

[10] See for example, Twigg 2005.

the time constraints imposed by work or family obligations. These variables are therefore included in the student background questionnaire/survey. But less tangible factors reported by students on this survey may also have significant impacts on learning. These include parental and external peer support, motivation and self-confidence, knowledge about and access to support, and quality of relationships. Analyses exploring the relationships among these factors, student demographics, and assessed learning outcomes would be somewhat more complex than those above, but could help determine the utility of variables like these for the AHELO operational programme. Again, including them in the Feasibility Study may lead to some of these variables being dropped as cost-ineffective for the operational programme.

- "Good Practices" in Teaching and Learning. A considerable body of past research suggests that specific practices in teaching and learning, as well as specific learning behaviours on the part of students, have a marked impact on assessed learning outcomes.[11] Investigating the differential impact of such variables, as well as their effectiveness in combination, is an important topic for academic policy at the institutional and programme levels. But it may be just as important a topic for national policy, as reflected in investments in teaching development resources or policies on student advising. Such variables include students' perceptions of academic challenge, receiving prompt and meaningful feedback, clear sense of direction, quality of effort, student-faculty interaction, and quality of relationships. Experience with PISA also demonstrates the utility of including these kinds of variables in AHELO and testing their utility through the Feasibility Study. Analyses designed to investigate the relative impact of these practices—individually and in combination—would resemble those described above. And again, they might yield enough information in the Feasibility Study to warrant dropping some of these variables later.

Investigating contingent effects (i.e. what works best for which populations of students) is of considerable interest in all three of these examples.[12] In addition to demographic variables, such analyses would require contextual data obtained from students about their exposure to different teaching/learning practices and external learning experiences. They might also usefully include faculty survey responses on the teaching modes used.

These examples are offered to illustrate the many kinds of analytical questions that can be addressed using contextual information. The most straightforward of these involve analyses using groups of students because virtually all of the data elements needed can be collected through a student survey. But the illustrations provided at the institutional and unit/programme levels are equally compelling as matters of institutional and national policy. This is why the panel of experts recommends strongly that contextual data drawn from all levels be included in the Feasibility Study.

Minimizing Burden

The panel of experts agrees with the GNE that the burden of collecting contextual data in the Feasibility Study is a concern. As a result, the panel devoted a good deal of its meeting to discussing strategies to minimize burden for participating institutions and programmes. The panel's recommendations in this area can be grouped under four main strategies—use existing data wherever possible, establish clear guidelines for survey length, allow variations across countries in the amount of contextual data collected, and prioritize variables according to analytical need.

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11 Prominent examples of such studies are Kuh 2008, Kuh *et al.* 2005; and Harvey and Knight 1996.

12 The topic of gender bias in engineering instruction provides a useful illustration here, for example, see Seymour and Hewitt (1994). For other examples of "contingent effects," see Pascarella *et al.* 2006 and Wabash Center 2008.

Existing Data

Countries and institutions differ in the amounts of documentary data that they compile about institutions, programmes, students, and staff. As a result, the panel of experts believes that some participants will be able to provide a significant portion of the contextual variables recommended from existing sources. This will allow the recommended surveys to be tailored to each country (and perhaps each institution) to remove questions about variables that are already available. Existing sources will generally consist of educational "census" statistics on institutions collected annually or biennially. But some additional data may have been collected through special studies designed for various purposes.[13]

To guide the process of assembling existing contextual data, the panel recommends that AHELO staff develop a "data map" for each participating country in cooperation with the country coordinator. This document would consist of a matrix of each variable flagged as to whether this variable has already been collected somewhere and, if it has, the properties of the data and how the data can be obtained.

Limit Survey Length

The panel of experts was especially conscious of the need to establish clear guidelines about the length of the surveys used to collect data for the Contextual Dimension. This is why they are providing the GNE with their own ratings of respondent burden and ease of response for all recommended contextual variables as part of the prioritisation exercise. But members of the panel also observed that the need to establish such guidelines varies considerably from survey to survey because of the expected degree of commitment to AHELO felt by the different constituencies surveyed. Students will be participating in AHELO voluntarily and will be administered the short background questionnaire concurrently. Once they have agreed to participate in the assessment itself, inducing them to participate in a short additional survey should not be a major issue. On the other hand, the length of student surveys needs to be carefully limited in order not to interfere with the time needed for testing. Consistent with PISA and similar instruments, a survey time of no more than fifteen minutes should be established.

Different circumstances with respect to motivation are associated with institutional and unit/programme leaders. Although they receive no material benefit from participation, these constituents can be presumed to be committed to the AHELO Feasibility Study or they would not have agreed to participate. As a result, concerns about the length of these surveys are less salient than they are for the other two surveys. Furthermore, it is important to emphasize that only one leadership survey (institutional or unit/programme) will be administered at each participating institution, unless it is participating in both the generic and a disciplinary strand.

The faculty survey is the most problematic of the four surveys with respect to respondent compliance because faculty may or may not be committed to the AHELO Feasibility Study. As a result, this survey needs to be short and easy to complete. Like the student survey, the panel recommends a total required response time of no more than fifteen minutes.

These guidelines should be built into the tender process for the development of the surveys. Results of the GNE prioritisation rankings can be used to cut items to meet these guidelines as necessary.

[13] Examples of such special studies that may be of use in some country contexts include Allen, Velden, and Yashimoto 2007; van Vught and Kaiser *et al.* (2008); and Westerheijden (2005).

Modular Approach

The panel also recognized that the ability to collect contextual data, as well as the perceived utility of doing so, may vary across participating countries. As a result the panel proposes a modular approach to collecting the recommended variables through which different countries might participate at different levels. The recommended levels are:

- Level 1 (Full Implementation). This option would involve collecting all the recommended contextual variables through a combination of existing data and the four surveys. It would afford the most comprehensive exploration of how context is related to AHELO assessment outcomes.

- Level 2 (Abbreviated Surveys). This option would involve using all four surveys but the leadership and faculty surveys would be shortened to about half the size used in Level 1 by dropping items that the GNE rates as low priority.

- Level 3 (Leadership and Student Surveys). This option would involve dropping the faculty survey entirely, with the two leadership surveys implemented as in Level 1. Using the Level 1 scope for the leadership surveys is necessary because, absent the faculty survey, this will be the only way to obtain information on matters like curriculum emphasis, pedagogy, and institutional or unit/programme cultures.

- Level 4 (Student Survey Only). This option would involve dropping the leadership surveys and the faculty survey, relying solely on the student survey to obtain any contextual information not available through existing documentation. The panel believes that the student survey will be the easiest survey to conduct because it will be linked directly to the cognitive assessments.

Although countries should be free to choose the level of participation with which they feel most comfortable, consideration might also be given to ensuring that two or three of these levels (including Level 1) be piloted. This form of "planned variation" might enhance the Feasibility Study by allowing the relative value of different amounts of contextual data itself to be tested.

Prioritisation

Finally, members of the panel of experts welcomed the GNE's request that it develop a process to establish a priority ranking for variables included in the Contextual Dimension. The variables provided in the first report of the expert panel were designed to illustrate the full range of topics that might be explored. It was never the panel's intention to recommend that AHELO use them all. To design a prioritisation scheme for use by the GNE, moreover, the panel cut this original list by more than half using four main criteria: feasibility, impact on learning, policy leverage (amenability to change), and importance in understanding context. Each member of the panel also provided his or her own overall assessment of the importance of each variable on a three-point scale: "essential," "relevant but not essential" and, "not relevant or of limited importance." Guidance to members of the GNE for completing the prioritisation process is provided in a separate document [EDU/IMHE/AHELO/GNE(2009)10].

Concluding Thoughts

As emphasized in its first report, the panel of experts continues to recommend that as many variables as possible be collected through the Feasibility Study. Although no definitive analyses can be undertaken because of limited or unrepresentative student samples, except at the individual institution or unit/programme level, many of these variables are crucial for distinguishing differences in context. Such differences, if they remain undocumented, could yield serious misunderstanding of the assessment results.

At the same time, the panel believes that many of the analytical questions that participating institutions and countries will want to pose and answer through AHELO are sufficiently complex that contextual data will be needed at the stage of the Feasibility Study to investigate their usefulness and practicability. And, of course, the feasibility of collecting such items itself will have to be tested.

The panel is very mindful of the need to reduce burden in collecting contextual data. Its members hope that the various approaches proposed to reduce burden by using existing data resources, allowing variations in the intensity of data collection from country to country, limiting survey response times, and prioritizing contextual variables to provide guidance about what to include will result in a data-collection process that maximizes the cost-effectiveness of this important dimension.

The AHELO GNE is invited to:

- TAKE NOTE and COMMENT on this analytical framework on the contextual dimension of the AHELO Feasibility Study.

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ANNEX 1 - MEMBERS OF THE EXPERT PANEL (MEETING 23-24 FEBRUARY 2009)

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ANNEX 2 - TAXONOMY OF ANALYTICAL QUESTIONS

A. **Differences in Outcomes Among Student Population Groups**

1. ***Demographics***
   - Gender?
   - Age?
   - Disadvantaged Status?
   - Socio-Economic status?
   - Prior parental participation in tertiary study?

2. ***Different Entering Ability Levels***
   - Different levels of entering student ability?
   - Different mixes of student ability levels?

B. **Effects of Various "Environment" Differences on Outcomes**

1. ***Curricular Structures***
   - Students enrolled in hierarchical vs. non-hierarchical curricula?
   - Extent to which disciplinary content or cross-cutting skills is emphasized?

2. ***Pedagogies and Good Practices***
   - Frequent feedback on academic performance?
   - Active learning experiences?
   - High levels of academic challenge?
   - Collaborative learning experiences?

3. ***Learning Environments***
   - Practice-based internships or similar settings?
   - Research centers or other research-intensive environments?
   - Institutions/programmes with graduate or advanced study?
   - Distance learning environments?

4. ***Cultures***
   - Research-based faculty cultures?
   - Teaching-oriented faculty cultures?
   - Institutions or programmes with prominent reputations?

5. ***Types of Instructors***
   - Full-time vs. part-time instructors?
   - Instructors who are also researchers?
   - Instructors with work or industry experience?

6. ***Student Population Mixes***
   - Highly selective student populations?
   - High proportions of traditionally underserved or non-traditional students?
   - High proportions of international students?
   - High proportions of students living on campus?

7. ***Availability of Student Support Services***
   - Tutorial services?
   - Counseling services?
   - First year integration or intake programmes?
   - Financial assistance?

8. ***Institutional Expenditure Levels and Patterns***
   - Institutions that spend more?
   - Different patterns of expenditures across activities or programmes?

9. ***Institutional and Programmeme Characteristics***
   - Enrolment size?
   - Type (e.g. research or teaching)?
   - Quality of physical facilities and equipment?
   - Location (e.g. urban/rural)?

C. **Effects of Various Student Behaviours on Outcomes**
   - Participation in informal group study?
   - Time on task dedicated to learning activities?

D**. Contingent and Interaction Effects**

1. ***Contingent Effects on Different Student Populations***
   - Active engagement for low-ability students?
   - Structured (or hierarchical) curriculum for underserved or non-traditional students?
   - Enrollment in particular types of institutions for non-traditional students?

2. ***Content/Discipline Contingent Effects***
   - Students enrolled in economics vs. engineering programmemes?
   - Generic skills growth across disciplines?
   - Are "good practices" for teaching and learning similar in economics and engineering?

3. ***Interaction Effects Among Different Treatments***
   - Study in groups and receive prompt feedback?
   - Engage in active learning experiences and high time on task?

E. **Outcomes Questions**

1. ***Relationships Among Assessed Outcomes Measures***
   - Is performance in engineering related to high generic skills gains?
   - How independent of one another are different sub-areas of content knowledge of economics?

2. ***Relationships Between Assessed and Behavioural Outcomes***
    - Are learning outcomes in the Generic Skills Strand related to high-wage employment?
    - Are learning outcomes in economics related to graduate school placement and performance?

3. ***Relationships Between Assessed and Self-Reported Outcomes***
    - Do learning outcomes in the Generic Skills Strand correlate with how much students say they learned in these areas?
    - Do learning outcomes in engineering correlate with self-reported outcomes in these fields?