Study on Indicators of ICT in Primary and Secondary Education (IIPSE)

Executive Summary

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EXECUTIVE SUMMARY

The need for international comparative monitoring in education

Monitoring educational progress through quantitative indicators is nowadays in many countries one of the regularly used tools for evidence-based policy-making. While national monitoring provides evidence regarding educational progress in one country, often countries feel the need for international comparisons for better interpretation of the national educational developments. In recent decades the interest for and participation in international comparative educational monitoring has increased substantially as witnessed by the ever growing number of countries that participate in international comparative educational assessments. These assessments are intended to assist policy makers to better understand to what extent their educational systems are measuring up with developments taking place in other countries.

Since the mid 1980s many governments have made major investments to equip schools with modern technologies in order to modernize teaching and learning and for providing students with opportunities to learn about these technologies and to acquire competencies that they will need in their future life and a need exists to monitor the use and impact of these technologies.

The current study 'Indicators of ICT in primary and secondary education' (IIPSE), which was funded by the European Commission, shows that throughout the EU there is a need for international comparative indicators regarding ICT in education.

This study was focussed on the 27 EU Member States, the 3 candidate countries and the countries from the European Economic Area.

The main issues that were addressed in this study concerned the characteristics of educational monitoring, policy concerns regarding the introduction and use of ICT in education, indicator needs and availability of international comparative data, and recommendations and potential actions by the European Commission.

What is educational monitoring?

The report contains a review of the characteristics of educational monitoring and the functions of monitoring for evidence-based policy-making. This policy-making can take place at different levels (international, national, regional and school).

It is argued that the core areas for monitoring educational progress concern the skills and attitudes of students as well as the opportunities to learn these skills at school and outside school. The distinction between primary and secondary indicators was introduced. Secondary indicators are needed to identify potential causes of weaknesses in the core areas. However, the problem was mentioned of defining appropriate secondary indicators before weaknesses are identified.

It was pointed out that in order to avoid undesirable impacts on educational decision making holistic monitoring is needed. It was also argued that multi-level monitoring may be an important option for the future. Several potential advantages of online data collection were mentioned that may play a role in further discussions about future EU monitors.

What should be monitored with regard to ICT in education?

An overarching question concerns the relevance for monitoring ICT in education. One could argue that ICT is just one of the many instructional tools (next to textbooks, school television, calculators, etc.), most of which are not monitored regularly. So, why then should ICT be monitored? One of the potential reactions to such statements might be that ICT is not just an instructional tool, but THE backbone of the information society, which touches upon almost every aspect of private and professional life. Just like reading and writing are traditional competencies transmitted through education, the effective use of ICT for learning, communication and cooperation is one of the basic competencies which schools need to care for. Monitors are needed in order to determine to what extent education systems realize these competencies and in which areas improvements are needed.

A related question is whether monitoring ICT leans too much on the assumption that the use of ICT should be promoted in all facets of teaching and learning. One should be aware that international comparative assessments can have a major impact on education. A currently common notion is that educational reforms can only take place if assessment practices are changed. When monitoring conditional factors such as the availability of ICT-infrastructure (hardware and software) and by showing differences between countries there is a risk of transmitting the implicit message that 'more is better'. In this study it is argued that, the core of monitoring ICT in education should be the competencies of students to use ICT for learning in a variety of domains. Conditional factors are of interest for exploring to what extent they have a potential positive impact on these competencies. If tests for measuring these competencies can be developed that are considered relevant in countries participating in a monitor, there is less risk of transmitting unintended messages.

The policy issues on which monitoring of ICT might be focused were inferred from an analysis of ICT-policy documents from countries throughout the EU. These issues could be subsumed under the following categories:

1. Infrastructure. This concerns issues like hardware and software and within these sub-issues such as access to the Internet, broadband connections, open source software.
2. Curriculum and content. This covers issues such as pedagogical approach (e.g. autonomous learning), content (e.g. development of methods), assessment (e.g. portfolio's, digital drivers license)
3. Outcomes and attitudes, e.g. competencies, digital literacy.
4. School leadership, e.g. change management.
5. Connectedness, e.g. national and/or international cooperation, public-private partnerships.
6. Teacher training, e.g. teacher competencies, pedagogical drivers license.
7. Support, e.g. the way and extent to which technical and/or pedagogical support is made available.
8. Transversal issues, e.g. equity, financing, safety.

Fifty-five indicator areas (covering these issues) were presented to national ICT-policy experts from 26 countries, who rated the need for international comparative indicators for evidence-based policy making in their countries. The highest needs for comparative indicators existed for: (1) opportunities for students to learn with and/or about ICT, (2) ICT-related competencies and attitudes of students, (3) ICT support (pedagogical), (4) Teacher training and (5) School leadership. Areas 1 and 2 are the core areas for monitoring, while the other areas may be considered conditional.

Which indicators are available?

From international comparative data that were collected from students by IEA and OECD since 2000, statistics were calculated about the use of ICT by students and about ICT-infrastructure in primary and secondary education. These statistics show interesting development over time, illustrating that in general students use ICT rather frequently, but also that the integration of ICT in the learning of school subjects is rather marginal.

Indicator definitions that were used in previous comparative assessments exist for many of the conditional factors (e.g. infrastructure, school leadership, support), although there are many data gaps for the current EU countries.

Lack of indicators

International comparative indicators for the core areas 'Students ICT-related competencies and attitudes' and 'Opportunities to learn' hardly exist. The definitions of these indicators have implications for the definition of secondary indicators. Hence, it is a matter of priority to develop, in the forthcoming years, definitions and measures for these core areas. A review was provided of current developmental work in ongoing national as well as international projects that could offer inspiration for R&D activities in the EU with regard to monitoring ICT in education.

Main conclusions

Below the main conclusions resulting from the analyses in the previous chapters will be presented. These conclusions relate to the following questions:

1. Which information from indicators regarding the Use and Impact of ICT in education is needed for policy-making?
2. Which indicators and data are available and what is missing?
3. How can missing indicators and data be collected?
4. What are the desired characteristics for educational monitoring in the EU (in general as well as for the Use and Impact of ICT)?

For reference purposes each of the conclusions are numbered.

1. Policy-makers need educational monitors in order to make inferences about the strengths and weaknesses in the competencies of students, how these are developing over time and what are the potential causes of weaknesses. This holds for education in general, but also more specifically for ICT. With regard to ICT the core questions which should be addressed by educational monitoring are: (1) are students during compulsory education sufficiently skilled to use ICT in the competency areas that are targeted by the European Commission for benchmarking, and (2) do students have sufficient opportunities to learn about ICT (in this study abbreviated as 'OTL-ICT') at and/or outside school? Indicators are needed for addressing these questions.

2. A survey among ICT policy experts in the EU showed that there exists a high need for indicators regarding 'Opportunities to learn with and/or about ICT', 'ICT-related competencies and attitudes of students', 'ICT support', 'Teacher training', and 'School leadership' (further detailed in Table 3.1).

3. Suitable indicator definitions do not exist for the key competency areas that should (ideally) constitute the core for monitoring ICT in education (see conclusion 1), namely the ICT-related student outcomes and opportunities to learn, which are called in this study 'primary indicators'.

4. Before indicator definitions can be generated, first the key competency areas need to be defined (in terms of assessment frameworks) and operationalized in internationally agreed upon (exemplary) tasks that students are expected to master at certain points during their school career.

5. International comparative indicators of student competencies in the EU, which are regularly collected, exist only for a few traditional subject areas. ICT related indicators collected from students mainly concern very general indicators of the use of ICT in and/or outside school. Moreover, for those indicator areas that are covered in existing international comparative assessments, data gaps exist in the EU^{+}: for many countries the time series since 2000 are incomplete or lacking at all. Hence, new indicators definitions and instruments need to be developed.

6. Ideally monitoring should lead to a well qualified evaluation of the strengths and weaknesses in educational systems. It was concluded that, in order to avoid undesirable side-effects, a broad coverage of competency areas is needed. Next to traditionally valued competences also so called 21^{st} century skills should be covered.

7. A first step in using indicator statistics from educational monitors should be the identification of potential weaknesses in student competencies and/or attitudes. If weaknesses exist questions can be generated that call for further analysis for which so called secondary indicators are needed. It was concluded that in the absence of statistics for the primary indicators it is difficult to define the secondary indicators that are needed for conducting these analyses. Hence, the analysis activity (mainly focussed on secondary indicators) requires separate data collection next to the data collection for primary indicators.

8. Previous assessments contain many examples of indicator definitions for conditional factors, the so-called secondary indicators. It was concluded that for future use these definitions need to be fine-tuned to definitions of primary indicators (regarding student competencies and OTL-ICT).

9. Educational change requires initiatives of many educational actors. National (regional and sub-regional) policy makers have to create conditions and set outcome targets. Also at school level school policies need to be developed which are based on a common vision and understanding among the relevant actors about the actions that need to be undertaken for realizing educational change. Just like international and national policy makers need educational monitors as navigation tools for evidence-based policy-making, also for school-policy making such tools are needed. Educational actors inside the school (including parents) would be informed about how the school is developing over years and how this compares with other schools. In recent years initiatives have been undertaken in some countries to develop tools for ICT-related school monitoring. More empirical evidence is needed on how these monitors function, how they offer support for educational reform at school level, whether they are up scalable to the education system at large and to what extent they are transferable to other countries.

10. From the analysis of existing practices for international comparative educational monitoring it was concluded that modernization of the currently used methodology is needed. Several considerations that have been dealt with in this report could be taken into account, such as (a) capitalizing on highly innovative forms of monitoring (through online data collection and authentic tasks), (b) holistic and multi-level monitoring (e.g. including school monitoring) and (c) tailored monitoring allowing for flexibility according to the indicator needs of countries.

The conclusions presented above indicate that there is a need for monitoring the Use and Impact of ICT in the EU. For developing a regular monitor initiatives from many actors are needed. For that purpose an organizational model needs to be developed. A useful organizational model has been practised in existing international comparative assessments. This organization consists of an international coordination centre, national coordination centres, international committees of experts for developing assessment frameworks and instruments for measuring student competencies, and national expert committees in which educational actors from different organizations are represented (ministry, school inspection, school leaders, teachers, parents).

Recommended actions

In order to design a regular monitor on the Use and Impact of ICT in education, initiatives are needed from several educational actors, e.g.: educational research communities, organizations involved in national monitoring of ICT in education, test development institutes, etc. The European Commission can play an important role in stimulating and facilitating the development of such a regular monitor. Below is an overview of actions that could be undertaken by different actors. A distinction will be made between short, medium and long term.

Short term

1. On short term the coverage of EU countries in regular assessments of IEA and OECD should be improved (see conclusion 5). Initiatives to realize this target could come from countries not yet participating in these assessments. This could be through ministries of education, but also through active networking by national coordination centres from already participating countries. The Commission could stimulate and facilitate these initiatives through it's regular contacts with these countries and potentially, if needed, (co-)finance the fees that are associated with participation in these assessments.

2. Initiatives are needed for a better coverage of ICT indicators in existing international comparative assessments (see conclusions 5 and 8). First a better coverage of school subjects for the current indicators on use of ICT is needed. EU researchers participating in these assessments could take

initiatives in this direction during the instrument development. Also this coverage could be realized by building into the overall design an EU regional option, with a focus on the areas mentioned in conclusion 2. The Commission could facilitate this development by (co-) financing the additional costs associated with designing such an option. It is also recommended that the Commission will play a pro-active role in the currently ongoing ICT-related initiatives that were mentioned in Chapter 7. Moreover, the feasibility of expanding the Eurostat household surveys by including students from primary and secondary education needs to be explored.

3. From conclusion 3 one may infer that new indicator definitions and instruments need to be developed. Given the complexities and manpower needed, this is not a task that single countries can undertake. Therefore, it is recommended that international cooperation is stimulated and that the Commission facilitates the creation and use of an European instrument bank containing measures that can be used for assessing the developments of ICT in education. The setting of priorities for indicator areas could be based on the overview provided in Table 3.1. Incentives might for instance consist of co-financing national projects in which measures from this EU instrument bank are used. The profit for countries would consist of being able to use measures that have relatively high quality and are extensively tested, whereas also (in case other countries use the same measures) comparative data become available without the need for a heavy international overhead. An initiative that could be undertaken by organizations involved in national educational monitoring of ICT would be to cooperate in order to harmonize the definition of indicators and instruments.

4. From conclusion 9 it can be inferred that tools for monitoring the Use and Impact of ICT at school level could be an important lever for educational change. It is recommended that the Commission issues a study in which characteristics and impact of existing ICT-related school monitors are investigated.

Medium term

5. Conclusion 4 calls for the development of assessment frameworks. In order to create these frameworks and tasks a number of steps need to be undertaken. A first step is to determine whether in the EU a core set of rubrics and assessment tasks can be defined for the areas that were mentioned in conclusion 1. Initiatives are needed from educational testing institutes from EU countries to develop (in cooperation with ICT experts) proposals for these areas and to provide evidence on international consensus regarding the relevance of the tasks. The Commission could stimulate this development through the regular research programs.

Long term

6. On the long term a modern system for educational monitoring is needed with characteristics as mentioned in conclusion 6, 7 and 10 (also taking into account the design recommendations mentioned in Chapter 8). Designing and implementing such a system is a complex process, in which the engagement of multi-disciplinary development teams is needed. This is a big challenge, but not impossible. Just as mankind is able to build sophisticated telescopes to observe far distant planets, it is certainly possible to create a system for permanent observation of educational progress.

7. In relation to the previous point, it is recommended that the Commission develops a strategy regarding the future of monitoring educational change (of which ICT is one component) in the EU. A key question is whether this monitoring will be run fully under the auspices and control of the Commission addressing the key core competency areas that are in the EU targeted for benchmarking. This would be a strategy for the long-term (10-15 years) which could set the scene for developing appropriate solutions for organisational, financial and methodological issues. Part of this strategy would be to sketch a vision on the responsibilities and roles of the Commission as compared to other organizations involved in regular international comparative assessments.