Technology makes a difference : inclusiveness of technology in education

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Publication date
2008

Chapter 6

CONCLUSION AND DISCUSSION

1. INTRODUCTION

The role of technology (Information and Communication Technology, ICT) in education has increased rapidly over the last decade. Students seem to be motivated to learn, to learn faster and to learn more when educational technology is used at school (Becta, 2006; Ruthven, Hennessy, & Brindley, 2004; Vier in Balans Monitor 2007). Educational technology is argued to have the potential to facilitate differentiation and individualization in education: it makes it possible to tailor both the content and the presentation of the subject matter to the individual backgrounds, experiences and needs of students (e.g., DeVoogd, 1998; Gillani, 2000; Volman, 2003). However, there are indications that not all students equally benefit from the advantages of ICT in education. Since technology has been introduced in education, related differences between students are associated with gender and the socio-economic and cultural backgrounds of students. From the viewpoint of equality in education, differences between students in relation to the educational use of technology, should be taken into account.

This thesis aims to explore selective effects of educational use of ICT on boys and girls and on students with different socio-cultural backgrounds. The opportunities and risks associated with the use of computers in the teaching-learning process will be analyzed from the theoretical perspective that 'assumptions about the user' are built into technological products; or so called 'scripts'. These scripts are not neutral, but imply human choices which are embedded in a cultural context, and can change over time. The problem definition is: What scripts are inscribed in the design of the tools and the use of technology in secondary education and how do these scripts work out for boys and girls and for students with different socio-cultural characteristics? Scripts will usually function unintentionally, as a part of the 'hidden curriculum'. When these scripts are not suitable for certain groups of students and these students are not able to identify with the supposed user, this may inhibit their learning.

At the same time, users of technology do not necessarily need to accept the scripts constructed by the designers. Scripts can be modified or rejected. Oudshoorn, Rommes and Stienstra (2004) describe how in processes of 'domestication' new meanings can be created or how new uses of the objects can be created. Finally, users can become non-users. These processes are situated in a cultural context, in which cultural codes are important. For example, gender codes play an important role in processes of domestication of the Internet (Van Zoonen, 2002). Oudshoorn, Saetnan and Lie (2002) elaborated the concept of scripts as 'gender scripts', in order to indicate the inscriptions and de-inscriptions of representations of masculinities and femininities in technological products. In this thesis we extend this concept to 'social scripts' which refer to scripts which may be related to gender as well as sociocultural characteristics.

The different levels in which scripts and inclusiveness of technology show, are approached from the perspective of curriculum theory (see Goodlad, Klein, Frances, & Tye, 1979; Van den Akker, 1998). Scripts can vary at these different levels. They are inscribed in the design of the educational tools (formal curriculum level). In an educational context, teachers play a role in modification of scripts, while they coach their students in the use of the application, and they can choose whether to use the application in their classes or not (operational curriculum level). Modifications of scripts initiated by students may be difficult. Students are supposed to use the selected tools, and they are supposed to use it in a way which is limited by the boundaries teachers set. Using technology which does not suit students may lead to a loss of their involvement and engagement (experiential curriculum level). In the end, this can result in differences in participation, attitudes and learning outcomes (Van Eck & Volman, 1999). In this thesis all three curriculum levels are addressed in order to understand how scripts and processes of domestication function in relation to inclusiveness of educational technology. Distinguishing between various levels of curriculum is necessary since inclusiveness of technology can work out differently at different curriculum levels. The inclusiveness of a tool at the formal curriculum level, does not by definition determine how the tool is used by the teacher (operational level) or how it is experienced by students (experiential level). Teachers can use a less inclusive tool in a more inclusive way (and the other way around), and students may be more or less affected by the scripts incorporated in a tool.

The problem of the thesis is laid out in four research questions which address the inclusiveness of educational technology at the different curriculum levels, and the question what is already known about differences between students with various backgrounds in relation to educational technology at school. The first research question was: "*How and to what extent do the characteristics of educational technology enhance or inhibit learning for different groups of students?*". We conducted a review study, with the aim to obtain an insight into scripts and to assign the underlying characteristics built into applications that may enhance or unintentionally restrict the attractiveness and accessibility of learning to different groups of students.

In order to get insight into the selective effects of specific educational tools in their context, a small-scale qualitative empirical study was set up. Four schools of secondary education, with a mixed student population and well implemented technology facilities, participated in this study. The second research question was: "*How*

are the social scripts of inclusive and non-inclusive tools enacted in classroom practice in terms of teacher and student behaviour?". The inclusiveness of the design of different educational tools, which were used at the participating schools, were analyzed at the formal curriculum level. These applications were also observed in classroom practice (operational curriculum level).

Preferences of students are another aspect which might influence selective effects of educational tools. The index of inclusiveness provides a framework for investigating students' appreciation of educational tools in relation to inclusiveness. The third research question was: *"How are gender and ethnic background of students related to their appreciation of educational technology in secondary education?"*. This question was addressed by a survey.

Gender differences on technology in education is an aspect which is most prominent and well documented in the literature. Differences between boys and girls on the experiential curriculum level is one of the effects found in the former part of this research project. In the final part of the research, we investigated the relationship between the supposed inclusiveness of particular educational tools and the actual experiences of students with these tools. Therefore, our fourth research question was formulated as: *"In what way is the inclusiveness of educational technology related to the learning experiences of boys and girls?"*. This research question was addressed by a qualitative study.

In this chapter, we present an overview and a discussion of the main results of the research. Firstly, we will give an overview of the results of the review study. Then we will present the results of the empirical studies. These results are ordered by the distinguished curriculum levels, which we refer to in different chapters of the thesis. Finally, we will discuss the results and method of the research as well as suggestions for future research and educational practice.

2. SUMMARY OF THE RESULTS

2.1 The review study

A literature review on gender inclusiveness and socio-cultural sensitivity on ICT in primary and secondary education was conducted. The aim was to obtain an insight into scripts and to assign the underlying characteristics built into applications that may enhance or unintentionally restrict the attractiveness and accessibility of learning to different groups of students (research question 1). The review resulted in an index of inclusiveness as presented in chapter 2. We focused on the literature on the differential impact of the characteristics of ICT as an educational tool on the learning processes and the learning results of different groups of students. The review considered the period 1992-2002, and concerned differences between boys and girls and students with different socio-cultural backgrounds. We found relatively few empirical studies on this issue, but a considerable amount of theoretical or practice-oriented reflective articles, which were included in the review.

In the literature, a number of characteristics are discussed that are supposed to be relevant in terms of the gender or socio-cultural inclusiveness of educational technology. Three major topics were distinguished into which these characteristics could be grouped: the content, the visual and audio interface, and the instructional structure of the educational tools. The common argument in articles on the *content* of educational tools is that in order for the subject matter to be meaningful to all students, there must be no obstacles for students to identify with the content of the tools. This should be achieved by taking a perspective that is multicultural, non-sexist and respectful towards different social classes. Therefore, a balanced presentation of diverse human groups is required and they should be presented in non-stereotypical roles. Furthermore, the content should be respectful and considerate of values, manners and taboos of different cultural groups. Finally, the subject matter should be presented in a real-life context, and should be addressing different interests.

As to the *visual and audio* aspects of the interface, largely the same issues are addressed. Again, it is argued that the presence and representation of diverse human groups should be balanced, and the visual interface should take into account the values and preferences of different cultural groups. This goes for the packaging and advertising of the educational tool as well. Audio material should include narrators from a range of group voices, and music and sounds should include a variety of styles. Using a diversity of visual and audio features in educational tools can make these tools more attractive to a wide range of students.

Several issues can be subsumed under the heading 'inclusiveness of the *instructional structure* of the educational tool'. It is argued that the learning process should be structured or facilitated by the tool in such a way that it suits different groups of students. Students should feel both comfortable and challenged while working with the tool. Firstly, different initial levels of ICT skills and content knowledge of students should be taken into account as well as differences in home language. Secondly, a variety of learning strategies should be taken into account. The third issue is the kind of learning activities that are addressed in educational tools. Social interaction is considered to be particularly relevant. Preferences for collaboration or competition in general, and for ICT applications facilitating communication in particular, have been found to be related to socio-cultural background and gender. The fourth aspect, relevant to inclusiveness of educational tools is the opportunity for students to receive help. Many authors mention the importance of clear and immediate feedback and scaffolds, which are particularly important for students lacking self confidence. The final issue considers the extent to which students are allowed to have their own input or take responsibility when working with the educational tool.

The 'index of inclusiveness' was used in our further research as indicated in the successive empirical studies.

2.2 *Scripts in educational tools at the formal curriculum level*

The 'index of inclusiveness' provided a number of characteristics which are supposed to be relevant to gender or socio-cultural inclusiveness of educational tech-

nology. With our second research question, we address the relation between the formal and the operational curriculum level. We first focused on the formal curriculum level, and examined how the elements of the index of inclusiveness were present in specific educational tools and how these characteristics might influence experiences of students. The index was used to determine scripts in the design of seven educational tools, which were used in four schools in secondary education. The analysis was conducted in relation to gender and socio-cultural background of students, and is presented in the first part of chapter 3. The second part of chapter 3 deals with the operational curriculum level and is discussed afterwards.

We investigated three tools for a language course (English, German and French) and four tools for social studies (History and Geography). Some tools were designed by a publishing-firm and belonged to schoolbooks which were used in the course. These applications had the same look-and-feel as the textbook and corresponded with the contents of the regular lessons, which, in general, is repeated and exercised in the educational tool. Other tools were designed by the teachers themselves and generally consisted of assignments like searching for information. Some tools consisted mainly of text with a few pictures, others could be classified as more advanced educational tools. In these tools, for example, feed-back was offered, students could play an educational game, or they could cooperate.

The study showed how social scripts are built in the design of the educational tools, and differences in the extent of supposed inclusiveness for different groups of students were found. The index of inclusiveness proved to be a useful instrument to identify social scripts in the tools and to typify the tools in terms of (supposed) inclusiveness. The most important element appeared to be the instructional structure of the tool. There was a clear difference between the tools in the extent to which students were supposed to work individually, and the compatibility to different ability levels, learning approaches and skills. Also differences between the tools were found in the extent of support to students, and the extent to which students could put in their own experiences and information, or to take responsibility for their learning process.

2.3 Scripts and inclusiveness at the operational curriculum level

The social scripts as found in the design of the educational tools, might be changed in classroom practice. In processes of domestication, teachers and students do not necessarily have to adopt the scripts, but they can modify them at the operational curriculum level. As teachers tend to adopt technology in ways that are consistent with their personal perspectives on curriculum and instructional practice (Niederhauser & Stoddart, 2001), this might also apply to the way they handle the inclusiveness of educational tools in the classroom. Teachers may deal with this point in various ways, their actions may diminish or reinforce the inclusiveness of the educational tool. So the next step in our study was to analyze the inclusiveness of educational tools as enacted in classroom practice. This second part of research question 2 was reported in chapter 3. The study was conducted on 6 educational tools which were used in 4 schools of secondary education. We observed teacher and student

behaviour in relation to items of the index of inclusiveness, accounting for gender and cultural background of students.

Firstly, we analyzed teachers' actions and behaviour, in coaching students while working with the specific educational tools. The results of our study suggest that at the operational curriculum level teachers hardly modify the social scripts in the design of the educational tools in relation to the inclusiveness of the content and the visual and audio aspects of the interface. Teachers do influence the inclusiveness of the tools in terms of instruction. They varied in the extent to which they adapted their instruction to students' prior knowledge and their learning activities, and in the extent to which they provided help. However, teacher behaviour that might be interpreted as reinforcing the inclusiveness of the instruction was shown more in relation to the tools that were already more inclusive. To sum, teachers' actions hardly modified the scripts of the educational tools.

Secondly, we analyzed responses of students. The social scripts as found in the design of the tools, and the inclusiveness of the tools as enacted in teacher behaviour in the classroom while working with the tools, seem to have their effects on the way students work with the educational tools. When more inclusive educational tools were used, all students participated more actively, they read the texts better, they posed fewer questions and they collaborated more. The results suggest that more inclusive tools enhance student activities which suit girls and minority students more than the less inclusive tools do. When working with the more inclusive tools, girls and minority students participated more and collaborated more, than when working with the less inclusive tools. Furthermore, the results suggest that students from minority groups need more help when using the less inclusive tools than majority population students.

2.4 Inclusiveness at the experiential curriculum level

At the experiential level, two studies were conducted. In the first study, our view was on characteristics of educational tools (research question 3), while the second study focused on specific tools which students used in class (research question 4).

Firstly, as presented in chapter 4, a study on students' appreciation of educational tools at schools for secondary education was performed. The aim of this study was to investigate whether students with different gender and ethnic backgrounds differ in their appreciation of various characteristics of educational tools, that - in the literature - are considered to determine the inclusiveness of tools. A questionnaire, based on the index of inclusiveness was developed and filled out by 495 students. The questionnaire appeared to be an appropriate instrument for distinguishing between tools which are positively and negatively evaluated by different groups of students. Regarding group differences, the results show that girls appreciate applications which deal with an interesting subject, which are easy to work with and provide good support. Boys were attracted to the tools with attractive pictures or tools which provide competition. To make a tool more inclusive to the students from different ethnic backgrounds, our data indicate that it is important to take into account

different levels of prior knowledge, especially regarding computer skills and language.

Secondly, we investigated the relationship between the supposed inclusiveness of particular educational tools and the actual experiences of students with these tools. We examined learning experiences of girls and boys while working with particular more or less educational tools. We focused on participation, attitude and learning effects as experienced by the students. This study was presented in chapter 5. The study included 160 learner reports and 24 student interviews, partly supplemented by class and student observations. We did find some gender differences in learning experiences, when boys and girls use educational tools in class. Both boys and girls seem to benefit more from inclusive tools than from non-inclusive tools, but for girls the difference is more prominent. Gender differences were present in the attitudes of boys and girls towards educational tools and towards learning in relation to the inclusiveness of the tools. Girls working with the less inclusive tools, were the least enthusiastic about the tools, compared to the other girls, and to the boys. Moreover, girls reported to work more easily with the inclusive tools. Furthermore, girls are more concentrated and actively involved in working with more inclusive tools, compared to working with the less inclusive tools. It is remarkable that the inclusiveness of the tools does not seem to affect boys in this respect: they do not show much difference in participation between inclusive and non-inclusive tools. Finally, girls who worked with the inclusive tools report to have learned more, and showed more enthusiasm about what they have learned, compared to girls who worked with the less inclusive tools, and to the boys. Girls seem to value inclusive tools more because of the feedback and support of self esteem that these tools provide.

3. DISCUSSION

We would like to continue this chapter with some reflections on the results and theoretical and methodological choices which were made in the research, supplemented by recommendations on future research and educational practice.

In this thesis, students' different relationships to technology were traced on the basis of a review study on gender inclusiveness and socio-cultural sensitivity, which resulted in an index of inclusiveness. The literature consisted mainly of theoretical and reflective material and little empirical research. We feel that our empirical studies contributed to the understanding of the functioning and effects of gender inclusiveness and socio-cultural sensitivity in educational technology.

The first issue we want to address, is the question of what determines the inclusiveness of educational tools. The index of inclusiveness in our research turned out to be a useful instrument in distinguishing between more or less inclusive educational tools at different levels of the curriculum, and between tools which are positively and negatively evaluated by different groups of students. From our qualitative study at the operational curriculum level we conclude that the teachers in our study hardly modify the social scripts, as present in the design of the tools. This conclu-

sion could suggest that the design of educational tools is an important determinant in the inclusiveness for different groups of students. However, we have to consider the fact that, in our study, teachers often designed the educational tools they worked with in the classroom, instead of using the tools which are designed by engineers and developers of educational software. The distinction of actors at the formal and operational curriculum level, which we proposed at the beginning of the project, thus, appeared to be less clear. Teachers designing their own educational tools have become common practice in Dutch secondary education, due to the fact that access to the Internet at school has grown, which offers teachers more possibilities to tailor educational tools to their own preferences and what they think is suitable for their students. Another reason why teachers might design the tools they work with is that they experience a lack of suitable educational software (Balanskat, Blamire, & Kefala, 2006). This practice implies that the formal and operational curriculum level are closely connected and are largely determined by teachers' concepts of learning and teaching, making it difficult to distinguish the factors determining the inclusiveness of the educational tools at different curriculum levels. These considerations suggest an alternative explanation for our findings. Niederhauser and Stoddart (2001) argue, that teachers tend to adopt technology in ways that are consistent with their personal perspectives on curriculum and instructional practice. This might also apply to the way they handle the inclusiveness of educational tools in the classroom. Teachers, who choose or even design more inclusive tools, are probably more aware of diversity in the student population and, consequently, behave in a way which could be interpreted as reinforcing inclusiveness. Therefore, we argue that teachers' awareness of inclusiveness is crucial to the inclusiveness of educational tools as enacted in classroom practice.

A second point of reflection refers to the learning experiences of students in relation to inclusiveness of the educational tools. The index of inclusiveness is related to the educational perspective that learning processes are fostered most when students are actively engaged in activities that are meaningful to them and are appropriate to their ability level and learning approach. From this point of view, some general principles can be distinguished, for example, the importance of authentic contexts, taking into account the prior knowledge of the student, the benefits of collaboration and the importance of good preparation and guidance of this process. Some of these general characteristics appear in educational theory and research as powerful principles of learning for all students (e.g. Dewey, 1916; De Corte, 2000), referring to good quality teaching, and, at other times, as principles of learning especially suitable for girls (AAUW, 2000) and minority students (Wang & Reeves, 2007), referring to inclusive teaching. Indeed, the results of our empirical studies indicate that students' learning experiences generally can be improved by the use of more inclusive educational tools. However, to the boys, the extent of inclusiveness of the tools do not seem to matter much, whereas learning experiences of girls are positively affected by the use of more inclusive tools. This is remarkable, because gender inclusiveness of educational tools is supposed to imply that the tools are attractive and challenging to both girls and boys. In the index of inclusiveness we distinguish the inclusiveness of the content, the visual and audio interface and the instructional structure of educational technology. Generally, we considered educational tools to

be more inclusive if they provided more ways for students to identify with the subject matter and different ways of working and learning. The results support the idea that less inclusive tools bother girls, and might address mainly the needs of boys. Some authors indeed argue that computers and software are predominantly male artefacts (Li & Kirkup, 2007), and that educational software is often unintentionally tailored to the interest of boys (Huff & Cooper, 1987, as referred in Cooper, 2006). The more inclusive tools, in contrast, might address both boys and girls. Therefore, we propose that inclusive tools are an improvement for girls and not for boys. The use of inclusive educational technology seems to provide good quality teaching, which means that it supports the learning of students with different gender and socio-cultural backgrounds.

Different types of research were conducted. A review study, a survey, and qualitative studies were carried out, in order to investigate inclusiveness of educational technology from different perspectives. We attach importance to some critical reflections that can be made on the scope of our research and to suggest some recommendations for future investigations.

Firstly, the qualitative studies are small scale. In these studies and the survey, we selected similar schools with respect to the diversity of the school population and the extent of computer use. The participating schools were more experienced users of educational technology. The idea behind the selection has been that we needed some diversity of students and some experience at school with educational tools in order to be able to study differences between students in the use of educational tools. However, this leads to a restriction of generalization of our results to other schools. For the time being, however, we do not have a reason to believe that our results are only valid for schools who are forerunners of ICT. Still, we would recommend a study of a larger and more heterogeneous data set of schools in future.

Secondly, the literature in our review is mainly from countries other than the Netherlands, which means that reported differences between students do not apply to a Dutch context. More specifically, minority groups are not the same in every country. In our small scale qualitative studies we did not have the opportunity to distinguish the results for different groups of ethnic minorities. The survey included more minority students than the qualitative studies, thus providing the possibility to distinguish these students largely into three groups. However, in future research we would suggest a study of a larger and more heterogeneous data set of schools, in which cultural differences between more groups of students can be investigated more precisely.

Thirdly, our qualitative studies investigated educational tools in language and social courses. We selected these courses in order to avoid obvious differences between boys and girls related to more technical courses. As we do know, inequalities between boys and girls are still more prominent in mathematics and science courses, which might reinforce differences in relation to the use of educational technology. Research on inclusiveness of educational tools including these courses, may be interesting and relevant in relation to differences between boys and girls in their choices of courses or studies. For the moment we feel that, regarding the results, the

providence of more inclusive tools will promote positive experiences of girls with ICT, which might influence their future choices of courses or studies.

Finally, in our survey we go into the various characteristics of different educational tools in order to investigate different appreciations of students with different socio-cultural backgrounds. The differences we found between groups of students reveal important indicators why these students appreciate an ICT tool or not. These indicators are summarized in the section on educational practice. However, more information is needed to understand the relation between the specific characteristics of educational tools and inclusiveness. We would suggest to focus future studies on the explanation of design principles or elements of the educational tool which cause differences between the groups of students. For example, a design study or a design experiment of various educational tools might give us more possibilities to explain (minor) changes in the formal and/or the operational curriculum level being responsible for the differences in learning and the learning experiences between different groups of students.

4. EDUCATIONAL PRACTICE

The main conclusion of our research is that educational tools seem to have selective effects for students with different gender and socio-cultural backgrounds. The inclusiveness of the educational tools seems to be related to the way students learn and to the reported learning experiences in terms of attitudes, participation and learning results. Students do evaluate educational tools differently on several aspects as indicated in the literature on gender inclusiveness and socio-cultural sensitivity, which was elaborated as an index of inclusiveness. The research shows that it is possible to distinguish the inclusiveness of the design of educational tools, and the way tools are enacted in classroom practice on the basis of this index. We concluded that teachers hardly modify the inclusiveness of the educational tools which are used in class.

To improve educational practice in ICT use, we would like to point out that students' learning experiences in general, can be improved by the use of more inclusive educational tools. The results of our study clearly show that several index elements which are of importance to specific groups of students, are also important to students in general. While students report that they learned more while working with the tool they appreciated most, improvement of these elements of an educational tool tend to be useful for all students and, in particular, for girls and students from minority groups, who will benefit most from these improvements.

There seems to be room to improve the inclusiveness of educational tools, by changing the social scripts in the design and/or by modifying the inclusiveness of the tools in educational practice. As it is a common practice in Dutch secondary education that teachers design or at least choose the educational tools they use in class, teachers should be aware of social scripts of tools. The index of inclusiveness might help teachers to increase their awareness and, consequently, adjust their teaching. We recommend more attention paid to the aspect of inclusiveness of educational tools in teachers' education, in order to improve teachers' awareness of how ICT tools work out for different groups of students.

To summarize, our study on students' appreciation of ICT tools showed that the gender differences we found generally confirm differences reported in the literature (Heemskerk et al., 2005): girls appreciate applications dealing with an interesting subject, which are easy to work with and provide good support. Some recommendations regarding the subject are made in the literature about what is interesting to girls, but we feel a certain choice of subjects may be preferable in order to serve both boys and girls. Although girls reported the importance of applications that are supportive and easy to work with and to understand, it seems obvious that such a design of the instructional structure is beneficial to all students. To make a tool more attractive to boys, a competitive element or a game could be included as an extra feature, as well as a choice of images.

The differences between ethnic groups in the Netherlands are more difficult to interpret and less extensively discussed in the literature. We found ethnic differences in appreciation of ICT tools in respect to language achievements and ICT skills in this study. To make a tool more inclusive to students from different ethnic backgrounds, our data indicates that it is important to take into account different levels of prior knowledge, especially regarding computer skills and language. In the literature several authors make a plea for anticipating differences in initial levels of prior knowledge and learning capabilities (Adler, 1999; Chisholm, 1995; Maurer & Davidson, 1999).

It seems neither possible, nor desirable to implement all guiding principles of the index of inclusiveness in a specific application. We, therefore, support the opinion that schools should offer students a variety of educational tools, in order to provide each student with interesting motivating and meaningful ways of learning. So inclusiveness relates to the entire collection of educational tools at school, and the index of inclusiveness can offer insight into the possible biases, and sensitivities and preferences of different groups of students. On the other hand, the differences between the tools in our research show that it is possible to improve the inclusiveness of the tools to such an extent that it effects student's learning positively.

We would like to add a last comment on the educational tools we investigated, and our terminology on ICT, technology, applications and educational tools. In this thesis the terms indicate the whole range of software which can be used as educational tools. The assumed rapid changes in the field of ICT and it's implications in education might seem hard to keep up with during the process of research for a thesis. The tools we investigated might be considered to be out-of-date already. We would like to point out, however, that the proceedings of ICT use in average schools should not be overestimated. Balanskat, Blamire, and Kefala (2006) pointed out that the lack of suitable educational software is still an important hindrance for further development of technology in education in most schools. They consider technology to be still underexploited to create learning environments where students are more actively engaged in the creation of knowledge rather than just being passive consumers. But whether the examined applications are out-of-date or not, the value of our study does not refer to the technological aspects of the particular tools we investigated. The

index of inclusiveness provides important aspects that matter to inclusiveness of educational technology. Therefore, it can be applied to other tools, as well as the new ones.

Schools have been occupied with the implementation of educational technology for quite a period now. Most attention was drawn to the equipment itself and the access to ICT. Recently, more attention has been paid to pedagogical consequences of the use of ICT in teaching and learning. The important issue of access to ICT for all students, without exclusion of different groups of students in relation to gender and socio-cultural backgrounds, lies at the intersection of access and pedagogy. The question what pedagogy can contribute to this issue, still deserves attention in educational practice as well as in future research.