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**DOI**

[10.1080/13540602.2011.538495](https://doi.org/10.1080/13540602.2011.538495)

**Publication date**

2011

**Document Version**

Final published version

**Published in**

Teachers and teaching: Theory and practice

[Link to publication](#)

**Citation for published version (APA):**

Heemskerk, I. M. C. C., Volman, M., ten Dam, G. T. M., & Admiraal, W. F. (2011). Social scripts in educational technology and inclusiveness in classroom practice. *Teachers and teaching: Theory and practice*, 17(1), 35-50. <https://doi.org/10.1080/13540602.2011.538495>

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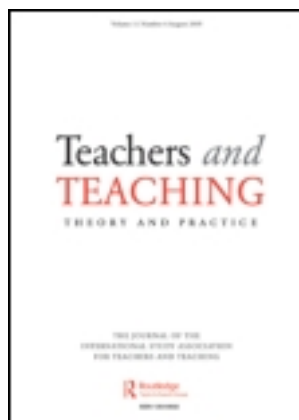
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Publisher: Routledge

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## Teachers and Teaching

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/ctat20>

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Available online: 13 Jan 2011

To cite this article: Irma Heemskerk, Monique Volman, Geert ten Dam & Wilfried Admiraal (2011): Social scripts in educational technology and inclusiveness in classroom practice, *Teachers and Teaching*, 17:1, 35-50

To link to this article: <http://dx.doi.org/10.1080/13540602.2011.538495>

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## **Social scripts in educational technology and inclusiveness in classroom practice**

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(Received 25 May 2009; final version received 19 March 2010)

Educational Information and Communication Technology (ICT) can be an appropriate tool for creating flexible learning environments. ICT can contribute to flexibility through its potential to keep content up-to-date and to address personal learning needs. ICT could, thus, make learning more accessible to a wider group of students. However, doing this requires that educational tools and the ways they are used in the classroom are experienced as challenging and attractive and, most important, inclusive to the students using them. In order to support the learning of all users, differences between students should be taken into account. In four schools for secondary education in the Netherlands, the relationship between social scripts in educational tools and the inclusiveness of the use of these tools in classroom practice has been studied. Our analysis shows that educational tools indeed differ in the extent of inclusiveness for different groups of students, particularly in their instructional structure. Teachers appeared to reinforce the inclusiveness of the more inclusive tools, but, generally, did not affect the inclusiveness of the less inclusive tools. When more inclusive educational tools were used, students participated more actively – they read the texts better, they asked fewer questions and they collaborated more. This is particularly the case for girls and students from minority groups.

**Keywords:** social scripts; inclusiveness; ICT; educational technology; gender; ethnicity; secondary education

### **Introduction**

Educational Information and Communication Technology (ICT) can be an appropriate tool for creating flexible learning environments through its potential to keep content up-to-date and to address personal learning needs. ICT could, thus, make learning more accessible to a wider group of students. Over the last decade, the use of technology in education has increased rapidly. However, there are indications that the use of educational technology in schools may work out differently for boys and girls, and for students with different socio-cultural backgrounds. Schools use ICT to a different extent and in different ways, and, even within schools, students have different possibilities to experience working with ICT (Schofield & Davidson, 2002; Solomon, 2002). These differences tend to be related to gender, and socio-cultural background of students. For example, there are indications that minority students in the Netherlands

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use educational technology at school more often in drill and practice applications, whereas Dutch majority students use more advanced educational tools and use the Internet more (Volman, van Eck, Heemskerk, & Kuiper, 2005). Moreover, the experiences of students working with a particular educational tool are, to a large extent, determined by their experiences with ICT outside school as well as their interests, attitudes and learning approaches. These out-of-school experiences may differ for boys and girls and can also be affected by students' socio-cultural backgrounds (Chisholm, 1995; Damarin, 2000; Volman et al., 2005). In earlier studies we asked students to evaluate their most and less favourite ICT tools, according to specific characteristics enlisted. This research indicates that girls liked ICT tools if they valued the subject matter as interesting. To boys it was more important that the ICT tools provided pictures that show additional information about the subject matter (Heemskerk, Volman, Admiraal, & ten Dam, in press). In other words, the use of technology in education may not necessarily be equally inclusive of all students. This situation conflicts with the aim of equality in education, and teachers may respond to these inequities in various ways.

Operating on the theory that teachers tend to adopt technology in ways that are consistent with their personal perspectives on curriculum and instructional practice (Niederhauser & Stoddart, 2001) as well as their efforts at inclusiveness in the use of educational tools in the classroom, our study focuses on how inclusiveness with regard to educational technology is enacted by teachers in classroom practice and how this affects students. In order to understand the mechanisms of inclusiveness of educational tools, we use the concept of 'scripts' as introduced by Woolgar (1992).

Scripts are assumptions about a supposed user that are 'built in' in the design of technology. These scripts, or 'user representations', may result in a design more suitable for a specific group of users and in the exclusion of other groups (Akrich, 1995; Rommes, 2002). However, users of technology do not necessarily need to adopt the scripts as constructed by the designers. Oudshoorn, Rommes, and Stienstra (2004) describe how in processes of 'domestication' new meanings can be created and new usage of objects can be created. 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 (Oudshoorn, Saetnan, & Lie, 2002; van Zoonen, 2002).

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 they use the application in their classes. Modifications of scripts initiated by students may be difficult. Students are supposed to use the tools selected by teachers, and they are supposed to use them in ways that are defined by the boundaries teachers offer. Using technology that is not suitable for students may lead to a loss of their involvement and engagement and can result in differences in participation, attitudes and learning outcomes (van Eck & Volman, 1999).

In this research, we elaborated the concept of scripts as 'social scripts'. Social scripts refer to scripts that may be related to gender differences as well as other social and cultural differences between students. Social scripts in educational tools (ICT) can be traced on the basis of literature on socio-cultural sensitivity and gender-inclusiveness in software. We distinguish three aspects of possible social scripts in educational software: scripts in the content of educational technology, scripts in the visual and audio interface, and scripts in the instructional structure of the technological tool (see Heemskerk, Brink, Volman, & ten Dam, 2005 for a review study). Questions framed by an index of inclusiveness (Heemskerk et al., 2005) can be articulated to indicate

whether social scripts are hidden in particular educational tools thereby causing less inclusiveness for particular groups of students (see Table 1). Students should be offered possibilities to identify with the subject matter and the way it is presented, and each student should feel both comfortable and challenged when working with the tool. Therefore, the structure of the programme and the kind of learning processes that are

Table 1. Index of inclusiveness.

1. Content	
1.1. Perspective	
Presence of different groups	<ul style="list-style-type: none"> <li>• Is there a balanced representation of diverse human groups (e.g. male/female; different cultural backgrounds, diversity of ethnicity/race; different social classes; urban/rural; diversity of religions/beliefs)?</li> </ul>
Representation of groups	<ul style="list-style-type: none"> <li>• Are the groups presented in ways that are positive, equal and non-stereotypical (e.g. variety of living situations, variety of occupational tasks and other activities, variety in human responses, aggressive as well as sensitive, active as well as inactive)?</li> </ul>
Contributions of groups	<ul style="list-style-type: none"> <li>• Are the groups represented in ways that reflect accurately their potential contributions to the subject of the programme?</li> <li>• Are issues relating to groups routinely included within the content as opposed to being separated out as ‘special concerns’?</li> <li>• Does the content avoid assuming that all people are operating from the same group, perspective and/or values?</li> <li>• Is it clear that decisions made in simulations may have different effects for different groups?</li> </ul>
1.2. Respectful of values	<ul style="list-style-type: none"> <li>• Is the content respectful and considerate of the values, manners and taboos of the different cultural groups?</li> <li>• Is the language free of biased terminology?</li> </ul>
1.3. Real-life context	<ul style="list-style-type: none"> <li>• Is the subject matter presented in an authentic context (e.g. by using the experiences of the students, actively involve the students in problem solving, addressing the usefulness of the subject in daily life, presenting a subject using different disciplines)?</li> </ul>
1.4. Addressing different interests	<ul style="list-style-type: none"> <li>• Does the material have the potential to attract the interest of all groups, not just represents a stereotype of the interest of one group?</li> </ul>
2. Interface	
2.1. Visual aspects	
Presence and representation of different groups	<ul style="list-style-type: none"> <li>• Is there a balanced representation of diverse human groups (e.g. male/female; different cultural backgrounds, diversity of ethnicity/race; different social classes; urban/rural; diversity of religions/beliefs)?</li> <li>• Are the groups presented in ways that are positive, equal and non-stereotypical (e.g. variety of living situations, variety of occupational tasks and other activities, variety in human responses, aggressive as well as sensitive, active as well as inactive)?</li> </ul>
Respectful of values	<ul style="list-style-type: none"> <li>• Is the visual interface respectful and considerate of the values, manners and taboos of the different cultural groups (e.g. in the use of colour, icons, pictures of animals and other images)?</li> </ul>

Table 1. (Continued).

Preferences of different groups	<ul style="list-style-type: none"> <li>• Are the preferences of different groups taken into account in the visual interface (e.g. bright vs. dark colours, detailed or not, clarity of images)?</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>• Do the packaging and/or advertising show a diversity of groups rather than one group to the exclusion of others?</li> </ul>
2.2. Audio aspects	
Voice	<ul style="list-style-type: none"> <li>• Does audio material include narrators from a range of group voices?</li> </ul>
Music and sounds	<ul style="list-style-type: none"> <li>• Does the sound track include a variety of styles of music/sounds?</li> </ul>
3. Instructional structure	
3.1. Prior knowledge	
Initial level	<ul style="list-style-type: none"> <li>• Is the material designed effectively and explained thoroughly enough so that all users can work with it, regardless of differences in               <ul style="list-style-type: none"> <li>• ICT skills and knowledge</li> <li>• Content knowledge and learning capabilities</li> </ul> </li> </ul>
Home language	<ul style="list-style-type: none"> <li>• Does the material acknowledge that learners may have a variety of home languages and take that into account (e.g. by using dictionaries, the use of clear language, multilingual)?</li> </ul>
3.2. Learning strategies	<ul style="list-style-type: none"> <li>• Does the material acknowledge that learners may have a variety of learning strategies and take that into account?</li> </ul>
3.3. Learning activities	
Collaboration	<ul style="list-style-type: none"> <li>• Does the programme accommodate learning together as opposed to competition?</li> </ul> <p>If working in groups is required does the programme:</p> <ul style="list-style-type: none"> <li>• Accommodate multiple roles and tasks</li> <li>• Provide all students with the opportunity to do different tasks and practice different roles</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Does the programme accommodate ways of communication with other people, e.g. experts, students?</li> </ul> <p>If communication is required does the programme:</p> <ul style="list-style-type: none"> <li>• Acknowledge that some students may have difficulty with asking (why-) questions, arguing with adults or formulating their ideas?</li> <li>• Acknowledge that differences in communication styles exist between different groups or different languages (e.g. differences may occur in frequency, length or tone of messages)?</li> </ul>
Skills	<ul style="list-style-type: none"> <li>• Are different kinds of skills addressed (e.g. writing, drawing)?</li> </ul>
3.4. Help	
Scaffolding	<ul style="list-style-type: none"> <li>• Does the programme offer scaffolding support, i.e. an apprenticeship approach helping the student to develop the necessary skills?</li> </ul>
Feedback	<ul style="list-style-type: none"> <li>• Is the feedback to the student positive and direct?</li> </ul>
Self-esteem	<ul style="list-style-type: none"> <li>• Does the programme offer support in a way that promotes the self-esteem of the student?</li> <li>• Does the programme offer ways for students to function as teacher or expert to other students?</li> </ul>

Table 1. (Continued).

3.5. Students' input	
Choice	<ul style="list-style-type: none"> <li>• Does the programme offer possibilities for students to have choice in how to work (e.g. are there different ways to use the programme, different solutions to the assignments)?</li> <li>• Is the student treated as an active participant with responsibility for their learning process?</li> </ul>
Flexibility	<ul style="list-style-type: none"> <li>• Is the programme made in such a flexible manner that students can alter parts to their preference?</li> <li>• Can students add their own information and experiences into the material?</li> </ul>

Source: Heemskerk et al. (2005).

facilitated by it must fit in with the ability level and learning approaches of different groups of students.

The problem we address is how social scripts are inscribed in the design of ICT as well as whether and how teachers and students modify the inclusiveness of the ICT tools while using them in the classroom. We distinguish between inclusiveness at the formal curriculum level and on the operational level. The former refers to the design of learner materials; the latter refers to the classroom behaviours of teachers and students (cf. Van den Akker, 2003). The research question is: How are the social scripts in inclusive and non-inclusive tools enacted in the classroom practice of teachers and in student behaviour?

**Methods**

***Participants***

The participants of this study are 81 ninth-grade students (age 14–15) in four schools for secondary education. The schools were selected according to the gender, socio-economic and cultural diversity of the student population. We included schools with 15–50% of the students from ethnic minorities, according to CFI<sup>1</sup> instruction. Included schools were recognized as innovators in the area of the implementation of ICT. In each school, one class of students was observed during four lessons – two lessons in a language course and two lessons in a social course in which educational tools were used (see Table 2). In total, seven ICT tools were examined.

***Data***

Two levels of curriculum are studied. The formal curriculum level was examined by two researchers who scored the tools independently focusing on the degree of inclusiveness. The operational curriculum level was examined by means of observations of teachers and students by two researchers during the use of ICT in the classroom. Field notes were made regarding the observations of teachers' and students' actions. Additionally, video records of the classroom and audio records of the instructions of the teachers were used in order to verify and supplement the field notes (Adler & Adler, 1994). In each class, four students were selected for observation forming a mixture of two boys and two girls, and two students from the majority population and two students from ethnic minorities in The Netherlands.

Table 2. Percentage and descriptors of students in four participating schools and observed courses.

Students in %	School A N = 13	School B N = 21	School C N = 27	School D N = 20
Courses	German History	English Geography	German Geography	French History
Gender				
Girls	53.8	54.5	63.0	60.0
Boys	46.2	45.5	37.0	40.0
Origin				
Minority	15.4	23.8	59.3	90.0
Majority	84.6	76.2	40.7	10.0

### *Instruments and analysis*

The choice of instruments used in the study was based on the index of inclusiveness (Heemskerk et al., 2005). The elements of this index as presented in Table 1 were used to explore the characteristics of several ICT tools in relation to inclusiveness as well as the way teachers and students respond on this curriculum.

At the level of the formal curriculum, the presence of social scripts in seven educational tools was assessed using this index of inclusiveness. Each subheading (1.1, 1.2, 1.3, etc.) was scored by two researchers who focused on whether attention in the ICT tool was paid to that particular theme: 0 indicates little or no attention and 1 indicates clear attention. For the clusters *content* and *interface*, a separate score was calculated for boys and girls, for students with high and low socio-economical backgrounds (SES), and for students originating from the Dutch majority or minority population. For the cluster *instruction*, we checked whether the instruction enabled a variety of ways of learning and working with the ICT tool. The scores on the *content* (with a range of 0–4), *interface* (0–2) and *instruction* (0–5) clusters were summed (0–11). This resulted in scores for gender, origin and SES, for each of the seven tools. The inter-observer agreement between the two observers is 0.85 in terms of Cohen's kappa.

At the level of the operational curriculum, we measured the inclusiveness of the use of educational tools in classroom practice with the help of two observation instruments. The first instrument focused on the observation of teaching behaviour in terms of the index of inclusiveness. For example, how teachers explain the use of the ICT tool, or whether students are invited to use their own experiences, etc. In addition, some general notions about the use of ICT, and about classroom practice such as collaboration or competition and participation of all students in the classroom, were included. The second instrument focused on the observation of the behaviour of the four selected students in each observed class, also in terms of the index of inclusiveness. Now, the items focus on how and to what extent these students participate and what roles and approaches (such as collaboration and communication) appear while they work with different tools.

The video tapes and researcher's notes of the observations were transcribed and were matched with items in the index of inclusiveness. For teacher behaviour, this



process resulted in summaries and reflections on the inclusiveness of teacher behaviour *vis-à-vis* scripts in the applied ICT tool. Using the index of inclusiveness (Heemskerk et al., 2005), four observers analysed these data and negotiated disagreements until the outcomes were agreed upon or disagreements were understood and reflected as such (cf. Marble, 1997). The analysis resulted in positive marks for teachers who reinforced the inclusiveness of the ICT tool or negative marks for teachers who diminished the inclusiveness of the tool. Positive and negative marks were summed separately.

Using the content analysis process described by Huberman and Miles (2002), we classified our observations of how students work with educational technology in the classroom as either participation or role and approach. Participation was operationalized as either duration of concentration and active involvement or number of times of distraction of students. Role and approach were operationalized as cooperation, communication and the ways students' use their skills such as reading or typing texts. Following Huberman and Miles' process, our next step was data reduction during which the data were sorted relative to gender and cultural background of students as well as to whether less inclusive or more inclusive tools were used. In this way, we developed a data matrix. In our final step following the Huberman and Miles' process, hypotheses were made regarding the relationship between student behaviour and more or less inclusive tools, between gender and tool impact, and between minority and majority students and their use of the ICT tools. These conclusions were verified by combing through the data for counter examples.

## **Formal curriculum level**

### ***General description***

Seven ICT tools were selected: three for a language course (English, German and French) and four for social studies (two for history and two for geography). The German and French ICT tools relate to textbooks used in the course. They are designed by a publisher and available via the Internet and/or CD-ROM. These tools have the same look-and-feel as the textbook and correspond with the contents of the regular lessons. The other ICT tools were designed by the teachers themselves and generally consist of assignments and searching for information.

Each of the ICT tools support some form of linear student activities, that is, students can read information supported by photos, drawings or short films as wells as navigate through the application, use hyperlinks, use different sources from the Internet, etc. The tools for German and French classes offer relatively little linear narrative material, while the two geography tools present a relatively large amount. Four tools might be classified as more advanced educational tools: two (accompaniments to the regular German and French textbooks) enable students to play an educational game or use city cameras via the Internet, and to receive feedback on their activities; two history tools enable students working alone to produce a *PowerPoint* presentation or a book chapter, or, working in groups, to research sources for a debate.

### ***Social scripts***

In addition to general differences, the ICT tools differ with regard to the extent of inclusiveness available for different groups of students. As noted above, we analysed

our data drawing from the index of inclusiveness (Heemskerk et al., 2005), in order to determine the relative inclusiveness of the ICT tools. We began by exploring the three clusters of the index of inclusiveness: *content*, *interface* and *instructional structure* relative to gender and student background. As noted earlier, inclusiveness of the *content* of educational tools is primarily determined by items that address students' varied interests and put the subject matter in a real-life context. Inclusiveness for *interface* relates to the way in which information is made available, which, among the ICT tools that we studied, showed that textual information followed by audio to be the most frequently used method of delivery. Inclusiveness of *instructional structure* relates to whether the way the learning process is structured or facilitated by the tool is compatible with the ability levels and learning approaches of students.

### Results

In Table 3, we summarize the frequency of the appearance of elements of the index of inclusiveness in the tools, separately for the three clusters of the index (content, interface and instructional structure). Taking the three categories of *content*, *interface* and *instructional structure* and examining them relative to students' gender and background yielded interesting comparisons among the three categories (see Table 3) relative to the social scripts that our data showed to be in use around them. For example, in the category of instructional structure a zero score for all items means that all students are supposed to work in the same way, namely individually, reading texts and answering questions. They have to work at the same level of difficulty concerning ICT skills as well as concerning their content knowledge and their respective levels of language achievement. Support, scaffolding and help functions are not provided in these ICT tools. The more inclusive tools, with higher scores in Table 3, are those adaptable to different ways of learning. For example, Tools 6 (History) and 7 (French) provided for different ability levels or offered a glossary.

Working in this way, we discerned that gender, SES and origin seemed to have little relationship to the inclusiveness of the content of the two geography tools (Tools 1 and 2) and one English tool (Tool 3) that we studied and most impact relative to the inclusiveness of the content of the two history tools (Tools 5 and 6). Similarly, low relationships emerge around the scores of inclusiveness for *interface* relative to both visual and audio material with the exception of tools for foreign languages where the French ICT tool (Tool 7) shows the highest score. In general, the *instructional structure* of the educational tools appears to be the distinguishing variable in determining inclusiveness.

Our analysis of the formal curriculum level suggests that gender diversity is most often taken into account, while diversity in terms of SES and origin were less often acknowledged. Overall, the inclusiveness for the three different categories is correlated, which means that the tools that are more inclusive in terms of gender are more inclusive in terms of origin and SES as well. The two history tools and one French tool (5, 6 and 7) can be considered the most inclusive tools. The two geography tools and the English tool (1, 2 and 3) appeared to be the least inclusive tools.

### Operational curriculum level; results

To determine the extent of inclusiveness at the operational curriculum level, we distinguish between teacher behaviour and student activities.

Table 3. Inclusiveness of the social scripts of the educational tools.

Application (school)	Content (range 0–4)	Interface (range 0–2)	Instruction (range 0–5)	Total (range 0–11)
<b>Tool 1 Geography (B)</b>				
SES	1	0		1
Gender	1	0	0	1
Origin	1	0		1
<b>Tool 2 Geography (C)</b>				
SES	1	0		1
Gender	1	0	0	1
Origin	1	0		1
<b>Tool 3 English (B)</b>				
SES	1	0		1
Gender	1	1	0	2
Origin	1	0		1
<b>Tool 4 German (A, C)</b>				
SES	0	1		2
Gender	3	1	1	5
Origin	0	1		2
<b>Tool 5 History (A)</b>				
SES	4	1		7
Gender	4	1	2	7
Origin	3	0		5
<b>Tool 6 History (D)</b>				
SES	2	0		6
Gender	3	1	4	8
Origin	2	0		6
<b>Tool 7 French (D)</b>				
SES	0	1		6
Gender	3	2	5	10
Origin	0	0		5

**Teacher behaviour**

Using the three clusters of inclusiveness – *content*, *interface* and *instructional structure* – identified in the index of inclusiveness (Heemskerk et al., 2005), and focusing on the six ICT tools that we studied and distinguished in less or more inclusive tools at the formal curriculum level, two types of teacher behaviour towards students are described: teaching that reinforces and teaching that diminishes inclusiveness (see Table 4).

Only a few inclusiveness stimulating or inclusiveness diminishing teacher actions were observed with regard to *content* and *interface*. However, with respect to the cluster of *instruction* various ways of reinforcing and diminishing inclusiveness were observed. It is striking that most inclusiveness stimulating teacher actions occurred when more inclusive tools were already in use.

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Table 4. Scores on teacher behaviour in relation to the index of inclusiveness.

Item of the index		Less inclusive tools		More inclusive tools	
		Further diminishing inclusiveness	Reinforcing inclusiveness	Diminishing inclusiveness	Further reinforcing inclusiveness
Content	Perspective				
	Respectful of values				+1
	Real-life context		+1		+1
	Addressing different interests				+2
Interface	Visual aspects			-1	
	Audio aspects				
Instruction	Prior knowledge				
	ICT		+3	-1	+1
	Content	-2	+1		+3
	Learning strategies	-2			+2
	Learning activities				
	Cooperation				+2
	Communication	-1	+1		+3
	Skills				+2
	Help				
	Scaffolding		+2		
	Feedback	-1	+1	-1	+2
	Self-esteem	-2	+1	-1	+2
Students input; choice and flexibility				+2	
Total		-8	+10	-4	+23

Note: Range 0–3, indicating the number of teachers showing the specified type of behaviour.

### *Teaching reinforcing inclusiveness*

Teachers used a number of strategies to draw students into use of the ICT tools. These included drawing on prior knowledge by referring to previous lessons or other material used earlier in the course, giving instructions that essentially got the students using the computer, making themselves available to answer questions and provide guidance, and providing choice in how to work. For example, students are encouraged to collaborate in a problem-solving task or to cooperate by dividing the tasks. Teachers reinforced the inclusiveness of a tool by offering help through scaffolding, positive and direct feedback, and enhancing students' self-esteem. Teachers give students hints or ask questions in order to help them to find the answers to the task. For example, a teacher tells students that they ask good questions, or tells them the answer is correct but that they should elaborate a bit more. Some teachers give students the opportunity to explore the tool and to share their discoveries with other students.

With respect to students' input, the inclusiveness of a tool is improved by giving students responsibility for their learning process and the opportunity to add their own information and experiences. For example, students can choose which tasks they want

to do in order to prepare for an exam. Students have to plan their actions, and the teacher gives individual advice about the planning.

### *Teaching diminishing inclusiveness*

Teacher actions that were interpreted as diminishing the inclusiveness of a tool in the cluster of *instruction* were less frequently observed. In an example with respect to prior knowledge, students appear to have difficulties with a task. In response, the teacher answers the questions directly without referring to prior knowledge. In another example, students have some difficulties with starting the tool. The teacher does not provide any instructions or reference to prior knowledge, but personally undertakes the necessary actions on the computer. Yet in another example, the content appears to be more difficult than the teacher expected. Help is provided individually and students have to wait for a long time before they can ask their questions. We also saw that communication with the teacher was sometimes hindered, because the teacher withdrew behind a computer and was not available for questions during a substantial period of the lesson. There were times when teacher feedback was negative and indirect. For example, a teacher says: 'It's often too difficult for you, isn't it?' or 'Do you still not know it?' In another example, a student has to skip a task because of lack of help from the teacher. Promoting self-esteem when it comes to ICT skills or knowledge is in some cases restricted to boys. In one instance, a teacher talked only with boys about technical aspects of computers (e.g. USB sticks and fire-wire, the failing start-up of a CD-ROM).

### *Students' classroom activities*

#### *Participation*

Classroom observations show that student participation seems to be less in those lessons with the least inclusive tools. In these lessons we observed some students chatting on-line (*MSN*), talking loudly or asking irrelevant questions. These classroom observations are in line with the observations of particular students (see Table 5). Participation, it seems, is higher in those lessons where more inclusive tools are used. This is particularly the case for girls and students from minority groups. For example, when using a less inclusive tool, one minority girl is working secretly on another course, and another one is talking with other students and looking at chat sites. In contrast, while working with the more inclusive tool, we observed that minority girls work equally well compared to majority girls. All girls are actively involved in the task; they work hard and appear to concentrate.

For boys the differences between the less or more inclusive tools are not as pronounced as they are among the girls. An exception is one of the boys who clearly has to make an effort to concentrate. He walks away from the computer or is off-task searching the Internet. These kinds of activities were not observed while the boys were working with the more inclusive tools. Then, all boys seemed to be working actively, to concentrate and to discuss content with teachers.

#### *Role and approach*

The atmosphere in the classes seemed to be generally cooperative and not competitive. When students were working with less inclusive tools, they often worked individually

Table 5. Student behaviour; participation.

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Less inclusive tools	
Girls minority	<ul style="list-style-type: none"> <li>• Not concentrated. Talks with other students, calls for help quickly and is easy to get distracted, for example, by chat sites of other students.</li> <li>• Half of the observed time working secretly on another course. The other part of the time she is working rather well, distracted only for a short while.</li> <li>• Messy start; mails answers to another student which is not the intention of the course. Afterwards rather good work. Once get distracted shortly by another student.</li> </ul>
Girls majority	<ul style="list-style-type: none"> <li>• Works hard and concentrated. Gets distracted shortly a few times by other students.</li> <li>• At first busy with something else than the task. Afterwards working hard and concentrated. Few short breaks (gazing out of the window and talking to another student).</li> <li>• Arrives a few minutes late. Works rather concentrated and diligent on the task, but part of the time busy with another site which doesn't deal with the task.</li> </ul>
Boys minority	<ul style="list-style-type: none"> <li>• Works concentrated and actively on the task. Gets distracted several times by other students.</li> </ul>
Boys majority	<ul style="list-style-type: none"> <li>• Works hard and concentrated. Talks with neighbour about the task and listens to the explanation of the teacher to the neighbour.</li> <li>• Works for the whole observation period hard. Consult the neighbour one time, and one time gets distracted by another teacher.</li> <li>• About half of the observed time quite active, but clearly has to make an effort to concentrate. Walks away from the computer to have a look somewhere else, or gets distracted by other matters and tries to find out if the teacher catches him working with Google, which is not part of the task.</li> <li>• Works well on the task. One short distraction by another student who is talking to the teacher.</li> <li>• Works hard on the task, together with another student.</li> </ul>
More inclusive tools	
Girls minority	<ul style="list-style-type: none"> <li>• Works hard on the task in cooperation with the neighbour.</li> <li>• Works nearly the whole lesson actively on the task. Some short interruptions by the neighbour.</li> <li>• Works actively and concentrated on the task, together with the neighbour. One time talking shortly about something else.</li> <li>• Works the whole lesson well and concentrated on the task. Gets distracted once by the neighbour about a test.</li> </ul>
Girls majority	<ul style="list-style-type: none"> <li>• Works hard and concentrated during the whole lesson. Sometimes consults neighbour on the task.</li> <li>• Works involved on the task. Sometimes consults other girls on the task.</li> </ul>
Boys minority	<ul style="list-style-type: none"> <li>• Works hard and with good concentration on the <i>PowerPoint</i> presentation. Cooperating with another boy.</li> <li>• Works concentrated and actively during the lesson.</li> <li>• Works actively on the task. Discusses the content with the teacher.</li> <li>• Not very active in doing the task. Consults a few times other group members on the task. Teacher involvement about the task division.</li> <li>• Works actively and concentrated on the task. Discussion with teacher about time-schedule.</li> </ul>
Boys majority	<ul style="list-style-type: none"> <li>• Works most of the time well on the task. Partly listening inattentive to other students or the teacher, or leaning backward yawning.</li> </ul>

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and rarely consulted each other. The more inclusive tools seem to invite students to work with their peers. However, different responses between groups of students were found. Girls and students originating from minority groups used the opportunity to cooperate more often than did boys and those from majority groups. Also girls have more interaction with their peers than boys did, and to work with the more inclusive tools.

We also found differences between the tools with respect to students' need for help. Students in general and minority students in particular appear to need more help from the teacher and their peers while working with less inclusive tools. With both type of tools, girls seem to ask more often for help from the teacher and their peers than do boys. Furthermore, our observations suggest that when engaging with the more inclusive tools, students read the text well, whereas the picture is more varied in the less inclusive tools with some students reading the text very well and some students who seemed inattentive. Finally, we noted that when students have to list the answers to the tasks in a Word document (which often occurs with use of the less inclusive tools), girls and students from the majority population seem to pay more attention to the layout than do boys and students originating from minority groups (see Table 6).

Table 6. Student behaviour; role and approach.

Less inclusive tools	
Girls minority	<ul style="list-style-type: none"> <li>• Reads the text, but not attentively. Has difficulty with finding the answers she needs. Types answers. Asks the teacher for help on the content three times. Asks two times for help from her neighbour. Provides help once. Works individually.</li> <li>• Reads the text with attention. Blocks and types text. Works individually. Asks for help from neighbour once.</li> <li>• Reads the text with attention. Works individually. Asks for help from teacher once about the content.</li> </ul>
Girls majority	<ul style="list-style-type: none"> <li>• Reads text extensively (also the introduction). Works individually. Blocks texts and types. Helps the neighbour once and does not ask for any help.</li> <li>• Reads text well. Works individually. Talks aloud to herself sometimes. Neither provides help, nor asks for it.</li> <li>• Reads the text with attention. Works individually. Has blocked the questions in the answer document. Types answers. Asks for help from the teacher once about the content and once from her neighbour.</li> </ul>
Boys minority	<ul style="list-style-type: none"> <li>• Reads texts, while moving the mouse on it. Cuts and pastes texts. Works individually. Asks once for help from teacher. Provides help to neighbour twice.</li> </ul>
Boys majority	<ul style="list-style-type: none"> <li>• Reads the text not attentively. Blocks texts and types. Asks for help from teacher once about the content. Asks neighbour or types the answers from neighbour. Works 'individually'.</li> <li>• Reads text with attention. Appoints text with the mouse. Blocks and pastes texts. Has a question for the teacher once. Works individually.</li> <li>• Reads text with attention. Types the answers. Works individually and sometimes consults the neighbour. Helps neighbour once.</li> <li>• Reads texts with attention. Cooperates with friend (1 PC). Consults about the answers. Sometimes he types or uses the mouse (mostly done by his friend). No need for help.</li> <li>• Reads texts with attention. Works individually. Gets irritated by wrong numbering of the answers. Doesn't ask for help.</li> </ul>

Table 6. (Continued).

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More inclusive tools	
Girls minority	<ul style="list-style-type: none"> <li>• Works partly together with friend (speech and listening French) and partly individually with the computer. Asks for help from teacher on computer problem.</li> <li>• Reads texts with attention. Cooperates with the neighbour. Searches for the answers together with the neighbour and they try to agree on it. They help each other and confirm each other. Types the answers. Tells to the teacher how to get typed text instead of the handwritten text in the programme.</li> <li>• Listens to text on PC with attention. Works individually and partly together with the neighbour (speaks and listens to French texts).</li> <li>• Reads the text with attention. Asks for help from the teacher once. Works in cooperation with the neighbour. They look for sources on one laptop and the neighbour types the answers on the other laptop. Third girl does not contribute much.</li> </ul>
Girls majority	<ul style="list-style-type: none"> <li>• Takes time to read the text with attention. Works individually. Asks three times for help on the content from neighbour.</li> <li>• Reads the text with attention. Works individually, but consults the other girls. Asks for help on the content from neighbour often and from the teacher twice.</li> </ul>
Boys minority	<ul style="list-style-type: none"> <li>• Works individually. Chooses to prepare a test with help of the schoolbook. Has to plan his work on a note. Uses laptop to look at web quest. Asks the teacher about the content once.</li> <li>• Works in cooperation with the neighbour. Discusses the allocation of tasks and the content of the <i>PowerPoint</i> presentation. They both have a laptop and they use different screens in addition to each other.</li> <li>• Reads the texts with attention. Works individually. Doesn't ask for help and doesn't provide it.</li> <li>• Looks up the web quest. Asks teacher something about it. Works individually. Chooses to prepare the test with books.</li> <li>• Waits until the e-mail with the <i>PowerPoint</i> presentation of group member arrives and then starts to work with it. Consults with group members about the slides, and with the teacher about the allocation of tasks. Works on his own part of the presentation.</li> </ul>
Boys majority	<ul style="list-style-type: none"> <li>• Reads the texts first and writes answers on paper. Works individually. Doesn't ask for any help and doesn't provide it.</li> </ul>

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### Conclusions and discussion

The role of ICT in education has increased rapidly over the last decade. However, educational tools may not necessarily be equally inclusive of different groups of students. We used the concept of social scripts in order to understand the mechanisms of inclusiveness. We focused on the social scripts embedded in the formal curriculum level of educational tools and investigated how these scripts play out at the operational curriculum level in terms of teacher behaviour and student activities.

From the analysis of the *formal curriculum level*, it appears that ICT tools can be distinguished as more and less inclusive tools specifically in relation to the instructional structure. The more inclusive tools appear to be more compatible to different ability levels and learning approaches. We surmise this may be so because they appear to address different skills of students, and because they support collaboration between students, provide students with adequate support, give students the opportunity to put



in their own experiences and information, and enable students to take more responsibility for their learning process.

Our study suggests that at the *operational curriculum level*, teachers rarely modify the social scripts in the design of the educational tools and do not seem to compensate for the weaknesses of the less inclusive ICT tools. In fact, teacher behaviour that might be interpreted as reinforcing the inclusiveness of the instruction is shown more often in relation to the tools that were already more inclusive.

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 ICT tools: those working with the more inclusive tools appeared to participate and collaborate more, to ask fewer questions, and to read the texts better than did students working with less inclusive tools. This tendency was particularly noticeable among girls and minority students.

The small size of this study, the choice of schools in which ICT tools were already in use, the teachers' hand in designing many of the ICT tools that they use – these are substantial limitations to this study. More information is needed to discern the validity of our main conclusion that teachers strengthen the social script present in the design of the tools. We acknowledge that this may be an artefact of Dutch secondary education where teachers often are involved in instructional design. An alternative explanation for our findings could be that teachers, who choose or even design more inclusive tools, are probably more aware of diversity in the student population and, consequently, behave in ways that could be interpreted as reinforcing inclusiveness.

## Note

1. CFI is an organization responsible for financing educational institutions and disseminating government information on education in The Netherlands.

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