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## The future of printed school books

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Title <b>The future of printed school books</b>		
Abstract <p>The aim of the study was to find out the outlook for the printed book and how it will fare in comparison to the increasing use of ICT at schools. The study was realised through interviews in three countries: Finland, the Netherlands and the United Kingdom. Background material on the use of ICT in schools in these countries is also included in the report.</p> <p>The people who were interviewed were teachers, school book publishers and e-book manufacturers. They were asked to give their opinions on the strengths and weaknesses of the paper book, on their ideal future learning environment and on learning material in general. A final task was to visualise a world without books – where did they go and why?</p> <p>According to the interviews, printed books have their indisputable benefits, especially when it comes to their ease of use, but they also have weaknesses that can't be overcome. Schools today want more interaction, personal projects and updated content. The printed book is not going to disappear from schools in the foreseeable future, but it will need to be supported by ICT. Future schools will most probably incorporate both printed and electronic learning material in order to enjoy fully the benefits of both media.</p>		
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# 1. Introduction

Printed books have been a staple in classrooms for a very long time. They have been used to teach nearly everything on the schools' curriculum. Books have strengths that have helped them survive: they have a simple user interface and are easy to use almost anywhere.

With the development of ICT and the emergence of new technologies, however, the status of the book as the learning material of choice suddenly seems less than obvious. Granted, the book will not lose its foothold overnight, but its position can be challenged. This is possibly the biggest change and challenge in teaching material that has happened in a very long time. Will there still be school books in five or ten years? How about twenty years?

This study was aimed to find more information about the current role of the book in schools, the future challenges, and the ideal teaching and learning environment from experts of the school world. For this purpose, interviews with teachers, publishers and eBook professionals were made in Finland, the Netherlands and the United Kingdom.

This report is part of a larger research project on combining a traditional school book with opportunities offered by digital technology. The results of the main project, Learning by Hybrid Media, are presented in a separate report (Seisto et al. 2010).

## 2. Description of the study

The starting point of the study was to find out how and why books (and ICT) are currently being used in different schools.

The study was realised as a series of interviews in three different countries: Finland, England and the Netherlands. The interviewees were mostly teachers, but also school book publishers and e-reader designers. The following table (Table 1) will show the distribution of interviewees by country.

Table 1. Interviews by country.

Finland	Two book publishing companies Two schools
England	One eBook designer Two schools
The Netherlands	One eBook designer Five schools

Most of the interviews, with the exception of the eBook designer sessions, were in fact group interviews, with several people present at the same time.

The interviews were structured quite similarly irrespective of the position of the interviewee(s). The basic themes were as follows:

- The role of the book at the moment
  - Its positive and negative aspects
  - Changes in book use during the respondents' careers
  - Other study materials being used today
  - Future changes in the use of books
- The ideal learning environment
  - The respondents were asked to imagine an ideal learning environment (without the limitations of the current circumstances)



## 2. Description of the study

- The future world/school without a book
  - The respondents were asked to imagine a situation where books have completely vanished from schools and the possible reasons for this development

It is worth remembering that this, as most interview studies, is a qualitative study. The results are not statistically significant and should not be treated as such. Also, respondents come from only three countries, so they only represent a small fraction of Europe. The publishers interviewed in this study all come from Finland, and, based on the results of this study, the market for school books is very different in all three countries.

Unfortunately, some of the recordings from the interviews in the Netherlands were damaged and ended abruptly in the middle. This means that there are significantly less comments from the Netherlands for the questions that were towards the end of the interview structure.

### **3. Study background**

The purpose of this section is to give some additional information about the schools in the three countries involved in this study. The different school systems will not be explained thoroughly, however, as that is not in the scope of this report.

For comparison purposes, results from the PISA tests as well as information about the use of ICT in schools will be used.

#### **3.1 The PISA study**

PISA (Programme for International Student Assessment) is an OECD study that has been realized every three years since 2000. The results of the fourth cycle, PISA 2009, will be published in December 2010. PISA studies assess student abilities in reading, mathematical and science literacy. Although all cycles have been used to assess student performance in all of the above-mentioned domains, the focus has been on one topic in particular during each separate cycle. (Unesco 2010)

PISA results have been discussed, analyzed and compared extensively every time they have been published. Finland, of course, has relished its top performance in the study. There have been efforts to find the reasons behind good – or bad – performance. Especially in the case of poor performance, the incentive to find out “where we went wrong” is strong in order to do better in the future.

Fuchs and Wößmann (2007) have researched different studies and articles on PISA results. They state that public assessments often aren't based on actual evidence from the PISA study but rather focus on repeating old beliefs. Even when PISA results are used, the comparisons are simplified by comparing two countries, usually the top performer and another country, or by presenting a simple correlation between student results and one single explaining factor (such as educational spending).

In their study, Fuchs and Wößmann (2007) found several factors that affect student performance in the PISA test. According to their results, the structure of the educational system has a large impact on student performance. An important role is held by external exit exams, which have a strong positive correlation with student results especially in

mathematics. Also contributing positively to student performance is school autonomy in process decisions, but on the other hand, centralized decision-making has a positive effect when deciding the overall school budget.

Students' background also plays a key role in their performance. Especially reading scores are affected by background factors such as the parents' education and occupation and the number of books at home. Group sizes don't seem to have much of an effect, but the education level of teachers as well as better equipment and instructional material have a significant positive impact. (Fuchs & Wößmann 2007)

In the last published PISA study, realized in the year 2006, the three countries in this study did fairly well and scored above the OECD average as presented in Table 2 (only the United Kingdom was slightly behind the average in the mathematics comparison). Finnish students scored the highest marks overall in all three categories.

Table 2. Mean scores in the PISA 2006 study. (OECD 2007)

Country	Mathematics		Reading		Science	
	Mean		Mean		Mean	
	Score	SE	Score	SE	Score	SE
United Kingdom	495,44	2,14	495,08	2,26	515,00	2,29
<b>OECD Average</b>	<b>497,68</b>	<b>0,54</b>	<b>491,79</b>	<b>0,60</b>	<b>500,00</b>	<b>0,53</b>
Netherlands	530,65	2,59	506,75	2,92	525,00	2,74
<b>Finland</b>	<b>548,36</b>	<b>2,30</b>	<b>546,87</b>	<b>2,15</b>	<b>563,00</b>	<b>2,02</b>

One significant difference between school systems can be noticed from the PISA study background data. Based on our interviews and knowledge of schools in different countries, it became apparent that in the Netherlands students are divided at an early stage into schools corresponding to their level of performance. This was emphasized by the following data:

### 3. Study background

Table 3. Percentage of students in schools where the principals consider the following statements as a "prerequisite" or a "high priority" for admittance at school. (OECD 2007)

Country	Residence in a particular area	Students' academic record	Recommendation of feeder schools	Parents' endorsement of the instructional or religious philosophy of the school	Student need or desire for a special programme	Attendance of other family members at the school
	%	%	%	%	%	%
Finland	75,21	4,24	2,07	9,91	16,63	12,76
Netherlands	10,31	65,33	90,25	19,49	19,59	4,46
UK	60,64	9,83	7,02	12,39	9,64	32,55

As can be seen from Table 3, student admittance is based mostly on the student's residence in a particular area in Finland and in the UK. In the Netherlands, however, the most weight is on academic records and recommendations.

Finland has prided itself on equality in education: "[...] the introduction of the basic education system is credited with delivering general equity in education in Finland. It has decreased differences in lifetime educational attainment between socioeconomic groups and regions." (Finnish Ministry of Education 2005) It is sometimes argued that this eagerness to make everything equal makes it impossible for gifted students to fully use their abilities. This theme will be apparent in the interviews, when it comes to differentiation in the learning material.

### 3.2 The use of computers and ICT at schools

Throughout most of Europe, investments in computers and ICT technology are made locally. This means that there is usually no rule that states the number of students per computer or the number of computers a school must have. Rather, these decisions are made by schools themselves or local authorities based on needs and priorities. Only some countries or regions have central recommendations specifying the student/computer ratio. One of these countries is the United Kingdom, where the required ratio depends on the level of education. (Eurydice 2004)

One of the problems with ICT use at school is making solutions and changes permanent. Schools are willing and eager to try out new technologies and gadgets, but in the long run, they tend not to change school policies and traditions too much. Also, schools are not equal: creating and maintaining the infrastructure needed for technology development requires large investments. These decisions are made on a municipality level

and are subject to local politics. This can lead to significant differences between municipalities. (Haaparanta & Tissari 2008)

The best way to use technology in learning is to combine it with the approaches of the new conception of learning. Technology can be fully leveraged in learning situations that focus on project work, subject integration, problem solving and student interaction. Technology is a natural tool for searching, editing and processing information as well as for collaboration. (Haaparanta & Tissari 2008)

The use of technology does not seem to be directly related to the teachers' technological skills. Rather, teachers feel it's more important to see the value and usefulness they get out of using technology in their teaching and in the students' learning. (Haaparanta & Tissari 2008)

The European commission has researched the use of computers at schools throughout Europe as well as the statistics related to them. The following figures in Table 4 are from 2006, so they are quite old for this kind of purpose, but give a trend of the differences between the three countries this study focuses on.

Table 4. Computers and ICT at schools. (Empirica 2006)

Country	% of schools with broadband	Number of computers / 100 pupils	% of schools with computers in classrooms
Finland	90	16.8	77
Netherlands	92	21	92
United Kingdom	75	19.8	95

All of the three countries are well above EU25 and EU15 averages.

#### Key findings from Finland (Empirica 2006)

Finnish schools have a high percentage of broadband connections, but the use of computers in classes is lower than for the two other countries in this study. Finnish teachers are not among the most active users of ICT in Europe, and Finland is ranked only 24<sup>th</sup> among the European countries when it comes to ICT use in class. Only 7 % of all teachers use ICT in more than half of their lessons.

It's also noteworthy that Finnish teachers are highly sceptical over the benefits of ICT use. 4 % of all teachers but 24 % of the teachers who do not use ICT in their teaching state that they are not convinced of any benefits of ICT use in their teaching. Also, 14 % of all teachers lack interest in using ICT in class.

So, although the technology is in place and often available, Finnish teachers seem to lack motivation and interest to fully use ICT in their daily work.

### 3. Study background

#### Key findings from the Netherlands (Empirica 2006)

All schools in the Netherlands use computers in their teaching activities, and almost all of them have broadband Internet access. Over half of all teachers, 51 %, use ICT in 10–50 % of their lessons, and 12 % for more than half of their lessons. Only 10 % don't use computers at all.

1 % of all teachers and 10 % of the teachers who do not use ICT lack the conviction for its benefits.

Even in the Netherlands, there is a small motivational problem among teachers, but despite this, the Netherlands rank 2<sup>nd</sup> in Europe when comparing the ICT readiness of teachers.

#### Key findings from the United Kingdom (Empirica 2006)

Although the percentage of broadband is quite low, all British schools use computers in education and have Internet access.

The figures for ICT use are high: 96 % of all teachers had used computers in class in the year before the survey. 65 % of teachers use computers for more than a quarter of their lessons, and of these, 21 % use it for more than half of their classes. The UK has the highest percentages for ICT use in Europe.

Almost all teachers, 95 %, are convinced of the benefits of ICT use in education. There are no apparent motivational problems affecting ICT use.

The only area with room for improvement is the amount of broadband Internet connections. Besides that, the survey found no other barriers for successful ICT use in education. It's therefore not surprising that the United Kingdom ranks 1<sup>st</sup> when comparing teachers' ICT readiness and use in Europe.

## 4. Results

Although school systems, ICT investments and decision-making vary from country to country, the interview results here will not be analyzed on a country level. Quotes from the interviewees along with their nationality will be used to underline similarities and differences across the field.

### 4.1 The role of the book

#### 4.1.1 The changing school book

In most schools, books are still very much involved in the daily learning process, and this has been the case for a very long time. This doesn't necessarily mean that although books have been around for centuries, they have remained stagnant and stable throughout the years. On the contrary, many teachers feel school books have evolved significantly during their careers.

*“I feel they [books] have evolved immensely quality-wise [...] In the beginning of the basic education school system, the quality and contents of books were very varied, they felt very quickly made. Now they are very well-thought-out and very carefully made.”*

*Teacher, Finland*

*“So that it's more illustrative, when the child doesn't understand what he's reading but can see in the picture that ”ok, there's that”. [...] there are more illustrative pictures.”*

*Teacher, Finland*

*“They use colour now. They didn't use colour when I started teaching.”*

*Teacher, UK*

#### 4. Results

*“Books are more attractive, they are abundantly illustrated.”*

*Teacher, Netherlands*

However, in some cases the sprucing up of books has perhaps gone too far, as the main focus of some books can sometimes shift from education to entertainment. One Finnish teacher recalled a mathematics book for elementary school children that had colour backgrounds – which had to be reverted back to basic white in the next edition, because the books started being a bit too over-the-top.

*“They [books] have been criticized a bit for being too entertaining.”*

*Teacher, Finland*

Colour and pictures aren't the only things that have changed in the school book world. It is possible to spice up the book by adding new dimensions and approaches. Even when there is no direct technical link to interactive or multimedia content, students are given the possibility to explore additional material outside the traditional framework.

*“There are some good textbooks out there that ask some really interesting questions and throw some really good activities as well and are funky and new and modern and what have you...”*

*Teacher, UK*

*“But what has changed also in the books is that there are a lot more support materials as well, also to make education more attractive.”*

*Teacher, Netherlands*

*“Many books also refer to websites that you can check out with children. And what I just indicated... DVDs are included. CD ROMs with interactive options are included and things like that. So a lot more links are created between what you can get from a book and what you in fact can get into that school via multimedia as well.”*

*Teacher, Netherlands*

The book still has a central role at schools.

*“We couldn't do without it.”*

*Teacher, Finland*



### 4.1.2 The advantages of books

Books aren't still in use just because of nostalgia or because there are no alternatives. They have indisputable strengths that currently can't be attained through any other medium. Books are stable – and although their inability to modify content can be seen also as a disadvantage, in the learning process it's often also a strength. You can be sure you will find the same information in the same place it was before, which makes revising easier. Online, information can sometimes disappear suddenly or be out of reach when you need it.

*"The user interface of a book is easy, because it's mechanically simple."*

*Publisher, Finland*

*"The book is a much more superior interface. The reason for this is, it's an interface which has been proven for centuries, and the book has... the form has remained unchanged. [...]It is a very efficient interface to browse for information."*

*eBook designer, UK*

*"It's a very democratic media in that it can be used by anybody."*

*Publisher, Finland*

*"It is trustworthy."*

*Publisher, Finland*

*"I think, first of all these obvious advantages of a book which is its robustness, for example, its durability, its ease of use and so on, and there is the emotional factor."*

*eBook designer, UK*

Some book characteristics make them especially strong in the fields of teaching and learning.

*"When you're reading a book you go into a subject more deeply because you're having to think, and I think when you read, the actual physical process of internalising the words and so on helps the child to understand better rather than simply to be able to gather facts. So, I think the book develops thinking skills in a way that the ICT might not."*

*Teacher, UK*

#### 4. Results

*“We will continue to use books. That is related to mental models. People who feel that knowledge can only come from books.”*

*Teacher, Netherlands*

*“The books themselves can trigger, you know, banks of memory which you thought you’d lost, go back to that...”*

*Teacher, UK*

Of course, the readiness to use ICT in teaching varies greatly by subject matter. One of the interviewees in the UK was an ICT teacher, and it’s obvious there’s little room or even need for books in that area, as it’s mostly hands-on learning. However, hands-on learning of a different kind is needed with certain school subjects. In some cases it’s important to write things down by hand to learn. Textual subjects, such as languages, are usually learned through textual media. For foreign languages additional audiovisual resources are certainly needed to help with for instance pronunciation, but text plays a very important role.

*“Writing by hand is an important skill, not just because you learn to produce text but also because it has a motoric effect, how it affects your nervous system [...], it has other benefits you don’t even think about on a superficial level.”*

*Publisher, Finland*

*“At the moment you also keep the writing up. At some point you can of course write on such a board, but it is a skill as well to be able to write with pen on paper. Because that is still something you need.”*

*Teacher, Netherlands*

*“You’d have to at least maintain the work by hand. However electric things become, doing things by hand shouldn’t disappear altogether, because it’s such a good and important route to the human brain. Children have different learning styles through which they learn, but at least in elementary school I always value learning through the hand.”*

*Teacher, Finland*

Some situations and certain students may require a specific approach to learning material. While computers might help some to overcome their personal boundaries, for some students the same effect can be achieved only with a book. Books allow a more focused approach on certain topics.

*”My students need the book, and especially a workbook that will be completed all the time on the side.”*

*Special education teacher, Finland*

*”They are very useful if you’re not there and you need to set work, or if you need a particular lesson that’s done very well in a particular book.”*

*Teacher, UK*

*”Things for which you need the book to help them focus and, or go back over a particular topic. So yes, the book is still there within the lesson.”*

*Teacher, UK*

*”What’s good about a book compared to the Internet is that irrelevant things have been filtered out. So you can focus on what’s important.”*

*Teacher, Finland*

Even in ICT teaching books can be used to focus and emphasize certain topics.

*”I’ve got the texts there, but in fact, the times that the children find them most useful is if they are learning skills, if they are going back to skills-based texts, and it can be useful if you make sure that you do have some ICT lessons which are not computer based so that they’re using the book to understand the wider implications of ICT ethics and so on, and the textbook can act as a useful focus for that because as you know with ICT, there is a danger to go off laterally and lack focus.”*

*Teacher, UK*

Multitasking is a basic computer feature that allows you to perform several tasks at once. Sometimes this can lead to difficulties in learning situations, because for instance accessing information in several applications can be cumbersome. This is often easier to do with printed material.

*”I find that students often have problems with being able to read the information that they need from one place and then do that with something else.”*

*Teacher, UK*

Technology creates its own challenges, because skill levels vary from person to person among both students and teachers. Student problems quickly become teacher problems.

#### 4. Results

*“Because it gives much more space for differentiation you are dealing with 30 individual problems.”*

*Teacher, UK*

*”It creates a calm atmosphere and is more reliable than ICT, you always have to wait whether it all works well and if it doesn’t work then it can be an excuse for a pupil.”*

*Teacher, Netherlands*

*“They have to be selective, they have themselves to be critical, and to teach that level of critical thinking is difficult, and it’s probably beyond the less able pupil.”*

*Teacher, UK*

*”It’s hard to make faultless operating systems or technical gadgets.”*

*Publisher, Finland*

*”One challenge is that it would be too much to assume that elementary school students could define by themselves what information they need.”*

*Publisher, Finland*

Some teachers might be reluctant to start using new systems because they fear their own skill level is not up to par. Finding appropriate material and keeping students focused can sometimes be challenging and time-consuming when compared to traditional book-based school work. In some cases, it can also feel like technology is taking centre-stage and stealing focus off what’s really important: what is being taught.

*“What’s the acceptable risk? Having taught geography for a long time, that’s, you know, it’s, you’re sat at a desk with a textbook or using something on a screen or watching a video or what have you. It’s much more controllable in terms of keeping kids on tasks. Less hard work as well. A lot less hard work.”*

*Teacher, UK*

*“It is timesaving, but teachers must acquire a lot of skill now.”*

*Teacher, Netherlands*

*“I think that it is also about getting used to it, because it also requires different skills again. If you want to have easy accessibility to the same knowledge as in a book, but on a computer, then that requires a large number of other skills to get access to that.”*

*Teacher, Netherlands*

*[Interviewer: It’s also challenging the teacher basically... it’s an extra requirement instead of just knowing how to teach from a book, now suddenly you all have to be IT gurus, to a certain extent.]*  
*“Yes, which they might not all really be very interested in because they just wanted to be teachers.”*

*Teacher, UK*

*“If you’re thinking about rolling it out everywhere across-the-board you’ve also got a skills shortage to think of as well. There are some subject areas in the school that don’t want anything to do with IT, and that’s largely because the teachers in those departments don’t feel very confident and comfortable with using it in a lesson.”*

*Teacher, UK*

*“Teachers’ willingness to accept any other material than print varies enormously.”*

*Publisher, Finland*

In unexpected situations, like power failures, you can still count on at least the book to work. One school experienced a very difficult situation: their computer class was damaged in a fire and the equipment was destroyed.

*“Yes, this year would have been a complete catastrophe without a book.”*

*Teacher, Finland*

The use of computers is sometimes justified by the variety they can offer. Sometimes book use is motivated by the very same principle. New technologies can create new worries for the effects they may have.

#### 4. Results

*”When they are at home, they can spend huge amounts of time in front of the computer anyway, and they have a TV or computer screen in front of their eyes all the time, so it would feel bad to give that as homework on top of all that. For that reason you much rather give a book so that they will use their hands.”*

*Teacher, Finland*

*”Even nowadays I try to arrange my teaching so that they wouldn’t sit at their desks the whole time. If that [computer] ties students to their desks even more tightly, it’s a disadvantage.”*

*Teacher, Finland*

*”I think the effect [of wireless technology] on health is one of the essential things that would have to be researched.”*

*Teacher, Finland*

Although using computers can be attractive to children, books and paper aren’t losing their appeal just yet – they are not appreciated only by older people who have grown up with them. Even children of the digital age value books and paper very much in certain situations.

*“The children, they like the book. They still like to have the book, particularly if we are going away from fact to fiction.”*

*Teacher, UK*

*“They do like to have the paper copy; they like to print out something they have done. Children are never satisfied just to have done something and have it stored on the computer. [...] They want to feel it; it’s got to be tactile. [...] They feel it’s got more validity.”*

*Teacher, UK*

*“It’s not the same thing as an icon on the screen as having it printed somewhere. It has a very different value, and I think we forget that objects, we develop an emotional attachment to objects, which we love and want to keep.”*

*eBook designer, UK*

*“So, in terms of factual knowledge, finding things out, the Internet tends to be used more than books, but in terms of reading and reading enjoyment, the book is still there very much.”*

*Teacher, UK*

School books are not just learning material; they are the source of income for their publishers. Although the Internet is often viewed as being “free”, there is a lot of worthless or even erroneous material online and not all quality content is available without a charge. For school books, material and knowledge is filtered and presented in an appealing form. Producing valuable content has to be attractive also to those producing it.

*“When you digitalise and provide to the student market then you know for sure... you will never sell another book. I do understand. And of course for a long time they had a point in saying ‘as long as it doesn’t contain protection, I am out!’”*

*eBook designer, Netherlands*

*”There has to be a possibility to produce high-class material. Or put it this way: somebody has to be able to earn by producing material.”*

*Publisher, Finland*

*”When I have talked with colleagues from other countries, they have been wondering about the way that in Finland the state doesn’t approve school books, but there’s free competition. They have been asking how the teachers are supposed to be able to choose their material themselves. When you think about the future, with different electronic material, it’s interesting to see how things are going to go in countries where traditional books need an approval from the ministry of education, the national board of education or an instance like that. So will there be an approval procedure for electronic material or will it become like a wild path where the teacher can choose what to use.”*

*Publisher, Finland*

*”There’s still a lot of material on the net that you can’t be bothered to read, because it’s just text, text, text.”*

*Teacher, Finland*

### **4.1.3 The disadvantages of books**

It is obvious that ICT has come to stay, and learning material is becoming available in a variety of forms and through different media. In many cases, computers can be leveraged more efficiently for a specific purpose. Books have their strengths, but also their obvious shortcomings and weaknesses.

#### 4. Results

*“A book is so fixed.”*

*Teacher, Netherlands*

*“So, what’s bad is that they get out of date very quickly... so within two or three years, a book will tend to be out of date, particularly in a subject like geography or in IT as well, perhaps less so in something like maths... where perhaps the same content would still be applicable because of the nature of the subject. They’re expensive, you need to replace them...”*

*Teacher, UK*

*“I guess another issue is because of the nature of the medium they tend not to last very long as well, if they’re being used...”*

*Teacher, UK*

As a side note, it is of course disputable whether books are really more prone to being destroyed than electronic equipment.

*“If you put electronics in book covers and if that book doesn’t stay at school but is carried around by the student, it sounds like it’s not going to last very long.”*

*Publisher, Finland*

The benefits of the Internet are its vastness and the almost limitless amounts of information it contains. Some things are impossible to have in a book. Often Internet is used in addition to more traditional learning material, to get that extra bit of information or to liven up a topic. Printed information can’t be updated easily, and in some subjects school books age quickly.

*“On the net you can find material that the book can’t have, such as the map teacher can have the map of this area on Google on the screen and then you can look for your own house.”*

*Teacher, Finland*

*“The textbooks are static whereas the web is dynamic and, you know, a rapidly changing time, and obviously we can update these like the books, in fact the books become obsolete.”*

*Teacher, UK*



*“One of the disadvantages is that information ages rapidly and is overtaken by new information. And such a school book must last for ten years before it is written off.”*

*Teacher, Netherlands*

*“We have already experienced a few times that there were mistakes in the book and I find that a real shame. But you cannot do anything but write in them yourself to correct it.”*

*Teacher, Netherlands*

Some subjects benefit from the more illustrative approach that is possible to achieve with computers. Simulations, step-by-step instructions and visualized transformations are among topics that can be a whole lot clearer when viewed on a computer.

*“When in science classes you do lab tests and not everybody has understood physical phenomena, you could read and tell and write forever about them, but then when you can try and do things yourself, the book is not necessarily the best medium.”*

*Publisher, Finland*

*“The subject doesn’t really lend itself to textbooks because it’s all interactive anyway so it therefore makes sense to have teaching and learning resources that are based on the same media.”*

*Teacher, UK*

*“Well, for example in natural science, you see that a lot more tests are simulated, simulation tests... which you of course cannot find in a book.”*

*Teacher, Netherlands*

Today, most computer-based learning is done at school. Students might have access to material online from their home, but that is often not required as not everybody has a computer or an Internet connection. The material that is available might be something extra on top of what is being required from the student. In some cases, students have access to the same material that is used at school, but they won’t be connected to the school network from their home and can’t thus submit their work from home. Books on the other hand are usually carried along between school and home, and there are some downsides to this.

#### 4. Results

*“One disadvantage [of books] is that students easily forget them at school or at home. So when they get homework, their book is missing.”*

*Teacher, Finland*

*“Just purely in terms of management of books is a difficult thing, I mean, if you, as I said with children, if they have textbooks at home, I mean how do you issue them, how do you take them home, how do you look after them, how do you get them back. Costs are high, relative to, you know, web-based materials.”*

*Teacher, UK*

Different learning methods require different tools. Project- or problem-based learning, where students are given a problem to solve on their own, is becoming increasingly popular. For this kind of work, computers are often used. Although information can be gathered also from books and libraries, it is often easier to try to find the required information all in the same place. Computer work is often more independent and gives more responsibility to the students as well.

*“One, the breaking down of the conventional classroom; two, the individualisation of learning, children working at their own pace, the ICT having a central role in that because it’s virtually impossible to do that just with texts. It takes a lot of management to do that whereas the computer can take out a lot of the management role. In terms of the assessment of the children’s work, the computer can make significant impacts on that and that assessment is a useful assessment for teachers.”*

*Teacher, UK*

*“It’s about involving the learner in the process, which maybe traditional textbooks weren’t that successful at.”*

*Teacher, UK*

*“What is very popular is project-related education, or theme-related education or problem-related education.”*

*Teacher, Netherlands*

*“The best thing about this method is that you hold the pupil responsible for his or her own learning process.”*

*Teacher, Netherlands*

The book is limited also because it has to be of a size that can be carried by the child. Often children have several books to carry, so there's little room for any extra material in a given school book.

*"For me one disadvantage is that when the exercise book is done, what then?"*

*Teacher, Finland*

*"We've got five or six different sorts of textbooks upstairs, which each of them do certain things very well, but none of them really do everything very well, which I suppose is a problem as well."*

*Teacher, UK*

When doing exercises in books, students don't get any feedback on how they are doing. Sometimes homework is checked, but often only by giving the right answers, and it's up to the student to correct their own mistakes based on an example. There's no instant feedback and often no possibility to think again about the correct solution if you think you got it right the first time. Computers give new opportunities to follow how students are performing in real time.

*"You don't get instant feedback or other confirmation whether you got it right from a book, a work book or a CD-ROM [if you have a CD-ROM for listening or viewing a movie]. But when you have an interactive device, the machine will react. [...] Another thing is following the progress of learning."*

*Publisher, Finland*

*"I think certainly with access to technology in schools becoming more prevalent, you are going to end up with a move away from traditional paper-based textbooks as we've known them and it's going to be more online content, more interactive content... benefits of that are that students can work through an activity online, give an assessment and get instant feedback from it."*

*Teacher, UK*

*"So every pupil is going through the material at his or her own pace and will then at some point work on a test. By means of a WinTest, everything is computerized."*

*Teacher, Netherlands*

#### 4. Results

*“Nowadays you do have a lot of good programs and you can see exactly what they are doing. You can find everything. And then you can also see what problems they have.”*

*Teacher, Netherlands*

Computers can be more attractive to children and add spice to traditional learning. They are not just used because they need to be used to follow a set policy. The use of computers and the Internet have to benefit the learning process somehow and bring something extra to the school work.

*“The computer must make a different learning process possible.”*

*Teacher, Netherlands*

*“I think that it can anyway be a lot more motivating for pupils than a book. Because you can make the subject matter a lot more attractive with moving images with sound.”*

*Teacher, Netherlands*

*“You don’t get variety necessarily as well, when you rely on a textbook, everything is... can be very much the same.”*

*Teacher, UK*

*“A side aspect is entertainment but it’s a lot more interactive.”*

*Teacher, UK*

*“The variation that you can then bring in, that is the great strength of a computer in my opinion.”*

*Teacher, Netherlands*

*“It creates a lot of agitation. Pupils who are excluded here at the school, pupils who disturb lessons because they cannot be captivated by a book, that is big. So there just has to be something else in the future.”*

*Teacher, Netherlands*

*“With a computer they are working far more focused.”*

*Teacher, Netherlands*

Differentiation is a topic that was discussed in almost all of the interviews. There were differences in the approach, however: some were worried about children falling behind their peers, others were willing to offer new challenges for the quicker students. Books

offer little in the way of differentiation. There are editions that are made easier to read, but they unfortunately underline the learning challenges some children might have. It's also impossible to produce printed and tailor-made school books for all kinds of learning styles and situations. Computer-based differentiation might enable creating appropriate material for children with different needs and doing it subtly, not by pointing a finger at those who have difficulties with keeping up the pace.

*“We see the breaking down the walls if you like of the school and of the class, so that the learning spreads out through different parts of the child’s day and that they can develop at their own pace and so the really able ones can move forward with their work, they can work with their parents at home while it’s... that is a real advantage over the conventional textbook.”*

*Teacher, UK*

*“You see more and more often that computer education creeps in, in addition to the school books. Especially for children who are at the bottom level, for extra help. But also for children who are at the top, simply as an extra challenge.”*

*Teacher, Netherlands*

*“Here in our school we now also have to deal with children who are for example very dyslectic and the computer with software and audio support is of course an extra aid.”*

*Teacher, Netherlands*

*“It must be aimed at the pupil. The beauty of this material is that you can gear it to the group.”*

*Teacher, Netherlands*

*“The book should be quite simple, but there would be additional information for those who do better. They would find it through the Internet.”*

*Teacher, Finland*

In some cases, the opportunities offered by computers, digital learning material and the Internet are not fully leveraged. There's still a lot of ground to cover in order to figure out what's the best way to present different types of information.

*“At the moment the electronic versions just tend to replicate the paper-based version so you’ve got an on-screen book.”*

*Teacher, UK*

#### 4. Results

*“But it is nevertheless mostly text from a book with questions and in fact more or less the same system as it was in the past, only digital.”*

*Teacher, Netherlands*

It's often not necessary to choose one or the other. Printed and electronic material complement each other. Using them together makes it possible to offer a very varying and flexible learning environment.

*“What we find works better is us as teachers coming up with our own resources because we can tailor-make those to the needs of the teaching group, but to get ideas for those resources we normally buy one or two copies of textbooks that are available and then borrow ideas from there instead to help us make our own things.”*

*Teacher, UK*

*“The book will be the minimum requirement. That simply needs to be finished. When that is finished you are for example allowed to search on the internet, but also in the computer programs which will then become available.”*

*Teacher, Netherlands*

*“The book is a basis; you have the text book and the work book. It makes the teacher's work easier, because the things are presented nicely there. But we do use computers quite a lot, we look at this and that on the Internet.”*

*Teacher, Finland*

*“If you think about ‘just in time learning’, electric media are certainly handy, because you can use them to access unlimited amounts of data, and you never know what you're going to need. But when you think about teaching the basic concepts that you know students need to learn, I think that books and print are strong, because you know beforehand what information should be made available.”*

*Publisher, Finland*

*“From a publisher's viewpoint it essential to master the entire field, where you have both, in the future.”*

*Publisher, Finland*

## 4.2 The ideal learning environment

The learning environment consists of the environment, obviously, of the learning material and tasks, and of the interaction between people. The interviewees were asked to visualize their ideal learning environment and all the things it encompasses.

*I1: “The best thing is when you can try, feel, hear, see.”*

*I2: “You could say that would be ideal, where you can...”*

*I3: “... where you can use all your senses.”*

*3 Teachers, Finland*

*”The boundary between school and life outside school needs to be lowered. Ideal learning environment and material are such that closing the school door doesn’t mean that you can’t really do anything anymore. I think it would be nice if homework would move without the need to carry a backpack, for example.”*

*Publisher, Finland*

*“It needs to be engaging. It needs to capture the students’ attention.”*

*Teacher, UK*

*“We are always restricted by what we currently have, actually more the money, but what our current view of what a computer is and how we learn with computers.”*

*Teacher, UK*

### 4.2.1 The ideal learning material

Many of the visions involved a new kind of reading device incorporating elements from a traditional book but also leveraging the benefits of computers and interaction.

*”A touch screen with a good user interface for each student would be a good start. Plus visualization [...] that you’d have material where you could really see the deeper essence of phenomena, I think that would further learning.”*

*Publisher, Finland*

#### 4. Results

*“One of these new kinds of devices that have no paper would be so ergonomic and handy. It would be of an optimal size and weight.”*

*Publisher, Finland*

*”In my vision there would be a hybrid so that when a student needs to practice things by him-/herself, you can print and copy for example a paper version of a certain passage.”[when discussing electronic learning material]*

*Publisher, Finland*

*“About the eBook... if you get enough features and a price that’s low enough, I think it could replace computers to a large extent in current use. At least in my teaching the use of computers consists of getting information. Students search for the topic online, but information is still not very easily searchable so that you’d find the things the teacher wants you to find.”*

*Teacher, Finland*

*“I have a vision that if I were to make a school book, it would contain about 10 pages that would be kind of like pages but think OLED displays or the like. There would be text, but then you’d press a button and you’d have 10 pages worth of Finnish exercises, you’d choose a topic and you could also flick through it but it would be electronic. The displays would be of a thin film and you could draw and write on it and save things onto a small integrated unit and maybe print things to take home with you. [...] Why wouldn’t it be a book? But what kind of a book? It could be the kind book you could put in your pocket or roll, which you could do. But anyway, it would be a book.”*

*Teacher, Finland*

*”Could it maybe happen that for example this kind of hologram technology, where I press here and it will project me a book page in good quality would come instead of this material where you can sort of electrically print text and it stays there until it’s changed.”*

*Publisher, Finland*

*”The device should be of a reasonable size.”*

*Publisher, Finland*



*“The worst that can happen to you as a society is that you are going to discourage reading because the devices on which you read are not functional.”*

*eBook designer, Netherlands*

Differentiation is strongly associated also with the ideal learning environment. In an ideal, there would be room to differentiate so that everybody could work at their own skill level. Learning material could be suited according to specific needs and everybody would have an easier time reaching their personal top performance level.

*“ICT makes it possible to differentiate even more than before, and different artificial intelligence systems could allow for more differentiation that the teacher has time for.”*

*Publisher, Finland*

*“Made to measure education is on its way. There are all types of children within a school, therefore you also need all sorts of aids. So normal books, but also the use of computer.”*

*Teacher, Netherlands*

*“In subjects like history and religion, and maybe physics and chemistry as well, you’d need a clear language version [of a book] that would be very simple, easily available, where you’d use short sentences and clear explanations. That would serve many kinds of students.”*

*Teacher, Finland*

*“You try to avoid drop-outs, i.e. outcasts and marginalization. What follows is that trying to keep things that way leads necessarily to leveling the field for everybody.”*

*Publisher, Finland*

*“If you think about the democratic nature again, even though you can in a certain sense think that these new devices are undemocratic and that it’s a question of money and readiness to use them. But on the other hand they make it possible to differentiate so that you can offer content that suits that specific person.”*

*Publisher, Finland*

#### 4. Results

*“Individualised learning is the way it’s going to go. [...] They take charge of their own learning rather than the teacher taking charge of it.”*

*Teacher, UK*

*“They also will become more responsible for their own capabilities and that it becomes more exciting for them.”*

*Teacher, Netherlands*

*“A different type of computer program will be introduced which will be both for support and for the purpose of getting greater depth. But which will also be geared at giving children the possibility to learn in an autonomous way.”*

*Teacher, Netherlands*

*”About the ideal environment... you’d take into account different learning styles. The best kind of learning for everybody is really not learning by reading, but you’d take all possible options into use.”*

*Publisher, Finland*

#### 4.2.2 Beyond the book and ICT

It is not just about what material is used and how. Education professionals, teachers and publishers alike, agree that no matter what learning material or medium is in use, students shouldn’t be left completely alone. Even when they are given self-guiding project work, there is one thing computers can’t replace.

*“Still, no matter how fine the teaching material is, the core of what happens at school, they say that the core of teaching is in the relationship between the teacher and the student. That is the thing that has the influence.”*

*Teacher, Finland*

*”If I think about a learning environment, I would see as an ideal that there would be a group of people. It’s somehow depressing to think that everybody would study alone in front of a computer.”*

*Publisher, Finland*

*”If there’s a good learning environment and situation, there is a teacher involved. Because really, if you have a truly good teacher, you don’t need any gadgets, you only need those who learn and the teacher.”*

*Publisher, Finland*

*“Every child has his or her own learning material, their own perception. But in addition to that, you must continue to coach them, you must give them a little nudge and continue to stimulate them and especially also measure, of course.”*

*Teacher, Netherlands*

### **4.3 The future school without a book**

The interviewees were asked to imagine a future school without a book. The task was to think about the factors that might have led to this and to imagine what would be lost in such a scenario.

#### **4.3.1 Why and where have all the books gone?**

One answer above all rose from the interviews when asking about the possible reason for the disappearance of books. Counterarguments from the publishing sector were also made.

*”Environmental reasons.”*

*eBook designer, UK*

*”Climate change has had an effect, you can’t anymore... now we’re running out of trees.”*

*Publisher, Finland*

*”A book is an ecological option and you can always burn it if it gets outdated.”*

*Publisher, Finland*

*“Our printing house people understandably need to do more about these issues... They have made these kinds of life span cost estimates and sincerely think that the carbon footprint is smaller for a book than for the same material when produced electronically.”*

*Publisher, Finland*

#### 4. Results

Environmental issues were not the only reason why people could imagine books disappearing. Mostly it was about technology development bringing about changes in the material that is being used.

*”The scenario that you don’t print things on paper anymore, it’s not that hard to imagine. It’s just a question of technology developing and becoming reliable enough and cheap enough.”*

*Publisher, Finland*

*“We actually get used to them and people’s habits change.”*

*eBook designer, UK*

*”I could imagine for instance that libraries such as they are now... In a couple of generations it would be impossible to fathom that you’d have to go someplace to get a book that’s printed on paper.”*

*Publisher, Finland*

*”Development in technology, especially how ICT applications can be used. Better displays, i.e. things related to ambient lighting and resolution. And then it’s been observed that with multimedia you can present things better for students who have different learning styles or methods.”*

*Publisher, Finland*

*”I believe in a developmental path where mobile phones will become generally used Internet terminals. [...] But I believe that alongside that there will be at some point an eBook device for stories you want to read, the kind of material that lends itself to a book format, and the format will still survive.”*

*Publisher, Finland*

*”I believe that when this kind of electronic paper is cheap and usable enough it will replace books printed in printing houses for environmental and logistical reasons, because you can deliver the same content and ergonomics.”*

*Publisher, Finland*

*“I think this is a transition phase. We are slowly moving towards using more computers. This is an intermediate phase. There’s still the book... but maybe little by little...”*

*Teacher, Finland*

In some cases, the respondents couldn't really imagine there being no books at all. Even though their numbers might diminish and their role in the school world would become smaller, there was no strong unanimous belief that books would disappear altogether. One medium doesn't need to replace another, because together they can provide a much wider scope and a more comprehensive experience.

*“You can't replace the textbook for all aspects of learning.”*

*Teacher, UK*

*“I think it will continue to exist but in limited numbers for sure.”*

*eBook designer, UK*

*“We don't have to print books because we want to make books. It's the customer need that guides us in the long run.”*

*Publisher, Finland*

*“None of this medium is actually perfect, and I don't see a competition between the screens and books. Each one should exist for different reasons and different experiences. I don't think there is a battle there.”*

*eBook designer, UK*

*“I don't think there are any advantages in the thing being completely ICT based.”*

*Teacher, UK*

*“The best approach is if each teacher can set his or her own priorities. [...] You progress in that development, in small steps, trying out new things. But without a book... no, I don't think that will work.”*

*Teacher, Netherlands*

*“At the moment I cannot totally imagine that we would only work with a computer, but I do feel that they can complement each other very well.”*

*Teacher, Netherlands*

*“But still, even though we have these new and wonderful visions, I still imagine I would love to have for example a lovely, soft paperback in my hands and read from it when I'm on vacation...”*

*Publisher, Finland*

#### 4. Results

Other possible explanations for the disappearance of books were learning situations for which currently there might not be working solutions.

*“If you’re learning at home, you don’t necessarily have books there. So the physical distance between teacher and student might lead to that.”*

*Publisher, Finland*

As stated before, it’s not obvious that digitizing everything is the key to success. Every tool has its strengths and weaknesses, and the appeal that computers and interactive material currently have among children might disappear eventually. Nowadays they bring variation to the traditional school work, but in the long run they might become routine and feelings towards them might change.

*”At what stage will children start to become bored with having everything in an electronic format?”*

*Teacher, Finland*

#### 4.3.2 What would we lose along with books?

*“I think we are going to lose something about emotional... we are already losing emotionally in terms of music.”*

*eBook designer, UK*

*”The smell of the book.”*

*Publisher, Finland*

*”Yes, sounds and smells. The sense of touch loses a lot.”*

*Teacher, Finland*

*”What you’re going to lose is that archiving and documentation.”*

*Publisher, Finland*

*”You lose the equality created by the book. In the current model, where electronic material is very varied and different, the teacher can choose to discuss something small, quirky and different. The book will however give the basic level to everybody.”*

*Publisher, Finland*

## 5. Conclusions and summary

Based on the interviews, it's possible to see that the book will have a central role at schools still for a very long time. Even the things suggested as replacements for the book usually had a strong book-like quality to them. Books have also evolved during the years and become more attractive to students. It's hard to see that all school work would be done in front of a computer, and even if there were no paper books left, in the visions they would mostly be replaced by their electronic counterpart.

Books have their indisputable strengths: their intuitive user interface, ease of use, possibility to use almost anywhere. Even when they are broken, books can usually be read to a certain extent. However, they don't currently offer many chances for interaction, updates, extensions or illustrative simulations, so other media are needed in addition.

Differences between ICT readiness vary from country to country. In this study, the three chosen countries were outwardly relatively similar, being all Western European countries and members of the EU. Even then, there were big differences with how ICT was used and what the teachers felt future would hold. This sample size doesn't however really lend itself to a very comprehensive analysis on the differences between countries and the underlying causes. However, the interviewed teachers' attitudes seemed to correspond quite well with the results of the Empirica study of computer and Internet use in schools.

If the new school environment brings about new challenges for the teachers, it will also give students much more responsibility for their own learning. The traditional lecture model will, at least in part, be replaced with individual projects and finding extra information outside the book. The possibility to differentiate material within a virtual learning environment will help both in motivating the quicker students but also in helping the ones who struggle.

The biggest hypothetical reason for the disappearance of books was seen to be the environment: are books ecological? What if we simply run out of trees? Electronic material is often touted as an ecological alternative, and loaded terms like "dead-tree books" are being used for printed material. Research, however, does not fully support this

## 5. Conclusions and summary

claim, but in the end, it's often people's attitudes and conceptions that make the choices in practice.

No matter what medium or what kind of material will be used in the future, there is one thing that can't be changed or replaced easily. Skilled teachers are needed to guide and coach students even when they are working individually with their computers. Teachers will have more challenges to overcome, not just because of the operating requirements of new equipment, but because individual learning paths can lead to individual problems. For this reason, the presence of a professional instructor is imperative.

All in all, it's all about choosing the best tools for the job at hand. It's possible and even quite probable that for some subjects, books will be used significantly less or not at all. For some teaching and learning tasks digital technology offers a clear advantage because of its interactivity, visualization and potential for showing complex demonstrations and simulations. However, printed books will still have a very important role, especially when it comes to very text-based subjects. Books can be enhanced through digital technology as well, and the future will most likely see schools use a combination of print and digital – thus getting the best of both worlds.



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