



## Opinion paper

## Computer usage for learning how to read and write in primary school



Petra A. Arndt

Transfer Center for Neuroscience and Learning, University of Ulm, Parkstr. 11, D-89073 Ulm, Germany

## ARTICLE INFO

## Article history:

Received 31 March 2016

Received in revised form

20 June 2016

Accepted 11 July 2016

Available online 26 July 2016

## Keywords:

Elementary education

Information technology

Paper and digital writing

Tablet computer

Handwriting

Early reading and writing

## ABSTRACT

Digital media are central to exchange information. Young people without sufficient literacy knowledge cannot participate in this digital society. Thus, starting to train reading and training writing with digital media as early as possible seems reasonable. But how early? Should we teach first writing and reading with digital devices? Practitioners and policy makers discuss this issue controversially. Scientific results lead to contradictory conclusions. It has been shown that writing by hand improves letter learning and memory. Other studies report e.g. higher motivation of students if digital media are used. This paper investigates the application of computers in written language acquisition. Examples and results of an inquiry in German schools are described. Since the use of digital media in the examples is confounded with teaching objectives diverging from traditional teaching, a final conclusion cannot be drawn. There is a lack of direct comparisons of early writing with and without digital media.

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## 1. Introduction

Digital media has become an important part of our everyday life. It is a part of our workplaces as well as recreational activities and has become increasingly present in education. There are concerns about possible negative effects of digital media especially on children and adolescents [1]. Nonetheless it is a widespread opinion that students should learn to work with digital media as early as possible. Early training in information and communication technology (ICT) is considered to be necessary to provide young people with 21st-century knowledge [2].

Moreover the use of digital media in education is expected to lead to improvements in social equality. The implementation of computers is considered to improve equal opportunities, especially if every child has access to online learning resources and ideally owns a personal device [3]. The idea applies to the support of disadvantaged children in developed countries as well as children in developing countries. For example, the one laptop per child program aims to provide children with cheap, robust laptops to support educational opportunities [4–6].

## 1.1. Digital media at school

Schools are given the responsibility to prepare young people for a life in the digital society [2,7]. This includes technical skills, safe behavior in the internet and expertise in using digital resources. For instance digital reading requires – in addition to the

skills for reading printed text – the ability to distinguish relevant and trustworthy text from irrelevant or dubious contents [2]. Some authors claim that digital media in education is necessary to provide adequate teaching for today's students, which grow up as digital natives [8]. Besides the new media this adequate teaching also implies a more personalized, individual teaching and an increase of students participation and collaboration in the classroom [9]. This would lead to an enhancement of motivation and engagement and to better learning outcomes.

Evaluations and research led to mixed results [10]. Evaluations of the first implementations of tablet computers (tablets) are based on qualitative methods, interviews and questionnaires. They often aim at the investigation of acceptance, first experiences and user judgements. Most of the publications aiming at these issues find positive results [11–13]. Teachers state to be able to use a wider range of learning activities, especially when portable media are used. Moreover teachers report improvement in their teaching [14]. In contrast Blackwell found that only few teachers changed their teaching practice when using iPads in early childhood classrooms [11]. Based on observations in classrooms and semi-structured teacher interviews she showed that iPads typically were used as a substitution for similar non-digital activities to support traditional teaching methods. In many investigations higher motivation of students and academic improvements are reported [4,8,12,15]. Students are reported to be more active, to produce and create in the context of their learning and to be no longer passive consumers. From these changes, which correspond to modern pedagogical concepts it can be expected, that academic achievement improves. While a part of research in this field supports this assumption, other studies found no or negative effects

E-mail address: [petra.arndt@znl-ulm.de](mailto:petra.arndt@znl-ulm.de)

on academic outcomes [16,17]. Large studies like PISA and OECD-inquiries showed that students achievements do not grow automatically with a higher number of digital media in the educational setting [2,18]. A similar result has been found for collaboration and interaction, which is reported to increase with the use of digital media by teachers [8,19,20]. However, Bebell and Kay [16] found, that this increase appeared for a part of the students only.

One explanation for contradictory results and the discrepancies between expectations and achievement is that the digital media are not used in an appropriate way, either due to technical limitations [12,15] or because teachers do not have the necessary competencies [21]. Kaganer et al. [9] bring forward that “Tablets offer hope for improving learning and collaboration but only if truly integrated into learning settings”.

## 1.2. Government policies

Although research results are ambiguous the positive expectations associated with digital media make it easier for politicians to set new requirements and gain recognition by investing money in ICT projects for education. Moreover, if political decision makers hesitate to invest in digital media for schools, different groups – political opponents and company representatives as well as committed teachers and considerate school leaders – [3] may blame them for putting the future of the youth (or the whole country) at risk. This could be one of the reasons why digital media was advanced by policies [6,16]. In some countries the decision to invest in digital media at schools was made on the national level, in other countries local authorities support ICT projects. Additionally smaller pilot projects were initiated by research groups, hardware and software companies, and individual schools or teachers. Several reports, especially internet sources, indicate that after the introduction of tablets, beginning with iPads in 2010 and followed by tablets from other companies these devices were adopted rapidly in education [12,15,22]. An overview given by Clarke and Svanaes [23] shows, that several countries and school districts launched large-scale projects to equip their schools and students with mobile devices. A successful implementation of these plans would have led to a considerable increase of digital media in education. However, the same overview shows, that a many of the projects have been delayed or canceled due to very different reasons (e.g. technical problems; higher costs than expected; insufficient learning/teaching content; loss, damage or theft of devices) [23], p.17 ff.

Nonetheless several countries included early media education in their curricula. The Common Core Standards in 48 of the 50 United States state that first grade students should be able to “use a variety of digital tools to produce and publish writing, including in collaboration with peers” [24]. However, the application of tablets and other digital media in learning to read and write as well as the approval of ICT in education in general differs between countries. Scandinavian schools are especially interested in the implementation of web-enabled tablets and corresponding research [19,25–27]. The Finish Board of Education considers touch typing more important than cursive handwriting. Thus the Finish government has decided to replace teaching of cursive handwriting with teaching of typing. For this, students will be equipped with tablets [23]. In 2011 the committee of inquiry “Internet and Digital Society” of the German parliament stated, that early media education is essential to ensure that every student can take the chances of the digital society and that instead of computer labs each student should have a personal mobile computer as a key to the knowledge sources in the internet [28]. However, schools and teachers as well as educational authorities in Germany are reluctant in adopting digital media in daily classroom activities. Till November 2013 the Institute of Educational Science, University of

Mainz had registered 93 German schools which had implemented tablet PCs in class. An online-survey answered by 54 of these schools showed that the introduction of tablets was mainly initiated by single teachers or headmasters (87% of the cases) and infrequently by local educational authorities or the ministry (14% of the cases) [21]. Overviews of the involvement of different countries in the use of digital media in education can be found in Clarke and Svanaes [23] and the OECD report [2]. These overviews show that in many cases national governments (e.g. Australia, South Korea, Turkey, Malaysia) or administration units like districts (e.g. Canada, USA, Scotland) spend huge amounts of money to equip schools with tablets or other mobile devices, sometimes in close cooperation with companies [6,29]. Clark and Luckin [12] integrated information from research papers, newspaper reports, and blog posts to give an overview of iPad use in the classroom in 2013. Existing pilot projects as well as just started governmental projects were collected globally with an emphasis of schools in the UK. They report that government initiated and financed programs often implement tablets on a 1:1 basis, i.e. one laptop of tablet for each student. Typically some kind of ownership model with personalized devices is chosen. 1:1 ratios are more common in secondary education, whereas primary schools often use class sets and share devices.

## 1.3. Digital media in early reading and writing

Only few primary schools implemented digital media on a 1:1 basis with personalized devices. Especially in those schools it is discussed whether learning to write with digital media should be prioritized over learning with paper and pencil. The idea is that writing is a complex task with several subtasks being organized simultaneously [30]. The processes of structuring words and sentences, retrieving letter information and spelling rules are complex by themselves. The motor control necessary for writing might pose an additional cognitive load that reduces cognitive capacities, which can be allocated to the other processes [31,32]. Thus it might be easier for very young children with still developing fine motor skills to use a keyboard instead of forming the letters by drawing a pencil over paper. On the other hand there is evidence that handwriting provides a stronger support for learning and remembering of letters and words than typing [33,34]. In the framework of the concept of embodiment [35] motor programs associated with handwriting are considered to be the basis of this advantage. They provide an additional cognitive representation and may contribute to memory and recall of learned letters and words [36,37]. The contradictory lines of argumentation, the concept of additional cognitive load evoked by handwriting on the one hand vs. the idea of a “motor contribution” of handwriting for learning letters, make it difficult to decide whether handwriting or typing should be taught to improve early learning to read and write. Thus additionally to theoretical considerations and experimental research results it might turn out to be helpful to incorporate practical experience in the discussion.

The aim of this paper is to depict the application of digital media in written language acquisition at primary schools and preschools (depending on the stage at which systematic instruction begins in the respective country). Experiences of teachers and stakeholders as well as evaluation results will be portrayed. The use of tablets is especially considered since these were adopted in education in large number during the recent years. Because they are easy to handle they can be considered a good solution for very young children [11]. The current paper focuses on early reading and writing, i.e. on becoming acquainted with the letters of the alphabet and on writing and reading the first words. However, appropriate additional objectives are considered as far as they exemplify chances and limitations of digital media in education

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