Tablets for a Redefinition of Learning? An Analysis of Video Observations to Determine the Integration of Tablets in the Classroom.

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Abstract: This paper is a report on the findings of a study conducted in nine German schools that were equipped with tablets. The study investigates in which ways tablets are integrated into the classrooms. Video-analysis techniques were used to examine the video observations taken in all schools. The use of tablets has been associated with the different levels of the SAMR-model. Findings indicate that in German schools tablet use, mostly, still takes place on the lowest levels (Substitution, Augmentation), primarily only to replace another application. The highest level (Redefinition) could only be found in very few situations observed. Although surveys show that tablets may increase learning motivation, they do not necessarily lead to didactical changes. It is discussed whether innovative research methods might be needed to explore the topic adequately. Data derived from surveys often mirror personal perspectives of the user. Video observations might provide a view on the actual usage itself.

Keywords: Videographie, SAMR, tablet, school, Germany

Introduction

Over the past years, numerous schools and school districts worldwide have been equipped with tablet computers. The use of tablets in classroom settings has already been discussed considerably in the past. In order to use the device to enhance learning in the classroom and at home, findings show that it is most effective to provide students 1:1 with personalized mobile devices. Thereby, the tools can be used for situated learning in the classroom as well as at home and students are able to use them as learning tools in a self-directed way (see Bebell & Kay, 2010; Burden et al., 2012; Müller & Kammerl, 2010; Petko, 2012). Thus, some German schools currently opt to purchase mainly tablets.[1] From a pedagogical and didactical point of view, it is interesting to research and evaluate possible changes in the transfer of knowledge resulting from the use of tablets. In addition, it is necessary to investigate modifications of didactics in regards to digital education materials and how they are integrated into the classroom.

Focussing on the teacher as well as on the media-didactical perspective, changing the teaching material does not only bring great potential to the classroom, but also challenges hitherto unknown teaching and learning situations and tests new didactical approaches. It is mainly the media-didactical competence of the teacher that is responsible for a change in forms of learning and innovative teaching concepts (see e.g. Mayrberger, 2013). German sociologist Röhl (2013) also highlights the role of the teacher and the importance of framing pedagogical situations. In an ethnographic study of mathematics and science teaching, he underlines that one important achievement of school teaching should be to lead students to an appropriate reception manner. He emphasizes the interplay between sensual design – apps are a good example for this – and their use. Transferring this to a classroom equipped with digital materials: It lies in the responsibility of the teacher to introduce didactical objects – as represented by digitized content – and to put them in action in a way they can be used to make content perceivable and ideally acquirable. Despite the potential tablets offer for teaching and learning, findings emphasize that this potential is currently not (fully) tapped.

Within the framework of two German surveys, „Start in die nächste Generation“ (engl.: Start into the Next Generation) and "Paducation" (see Kammerl & Unger, 2015, 2016; Welling et al., 2014), the introduction of tablets into school classrooms is examined from three different perspectives. From a theoretical perspective that focuses on educational technology, integration processes are mainly considered as providing tablets and apps, using them, and learning with them. However, from the perspective of integrative media didactics, which

[1] At German schools, primarily devices by Apple are being used, but also Samsung and Microsoft find their way into the classrooms. Google Cromebooks, which are strong in the United States, are not an option for the German user, since their use is not allowed in German schools. According to the German data protection law, schools may not use any device which enables them to store personal data on external servers. All data has to be stored on servers located in Germany.

is essential for the project, three other features are being emphasized: for teachers these are the methodological innovations (1), (and therefore possibly) the improvement of accomplishing objectives of professional education (2), and promoting media literacy of the students (3).

In the German public debate about digital media in schools, it is frequently assumed that the introduction of tablets and other personal devices alone equal “digital learning” – and perhaps even “better” learning. However, looking at the empirical findings for tablet use derived from several German school projects (see e.g. the aforementioned; Bastian 2016; Bastian & Aufenanger 2016), it becomes apparent that the existence of tablets alone does not necessarily mean, that they play a central role for either the teacher’s actions or the student’s learning. Welling et al. (2004) report, that in the project "Paducation" students were invited to bring their personal devices to school and use them for their learning. However, only around 50% of those students owning a mobile device took advantage of this offer. A similar phenomenon has been seen when all the students were equipped with tablets. Within the same project students were given free tablets to use them in school as well as in their homes. Nevertheless, the findings show that the personal iPads did not necessarily play a central role for the students’ learning at school and at home. Within the project’s framework, this resulted, on the one hand, in the demand to disestablish "learning islands" (Kerres, 2006) with personal devices and, on the other hand, it promoted the claim of establishing a "personal learning environment" (Attwell, 2007) at schools instead. Another question to be asked is, whether the tablet is actually used in a way that supports the establishment of such personal learning environments and whether teachers understand the expanding didactic potential.

The Study

The study presented here is carried out by the Institute of Education at the Johannes Gutenberg University of Mainz in Germany and funded by the Rhineland-Palatinate state government. The study investigates in which way tablets are integrated into the classrooms that were equipped with mobile devices. Is digital media used in a way that supports learning? Does the didactic potential change and does it offer new options? Can we even describe a redefinition of learning?

In order to answer these questions, nine German schools of different school types were equipped with tablets and accompanied over four years (2013-2017) through a scientific study (Aufenanger, 2014a, b; Bastian 2016, Bastian & Aufenanger, 2014). In German-speaking countries, studies have shown that the motor for school development should always be the individual school (Rolff, 1991), where concepts and ideas are adapted and re-contextualized to their own school culture (Holtappels, 2003). In our Project, we therefore accompany schools that have, on the one hand, made the decision to invest the money and equip themselves with tablets or, on the other hand, successfully applied for a funding of the equipment at the Ministry of Education of Rhineland-Palatinate. The schools involved in the project are two *Gymnasien* (a type of school combining Middle and High school up to $12^{th}/13^{th}$ grade), three *Realschulen* (a type of school combining Middle and High School up to 10^{th} grade), and two *Integrierte Gesamtschulen* (a type of school combining Middle and High School up to 10^{th} or $12^{th}/13^{th}$ grade), and two *Förderschulen* (a type of school for special-needs children).

Taking a look at the temporal progress of such projects, it is usually assumed that media-related innovation projects run on several levels: Firstly, single teachers try out new concepts coordinating them with school management and control groups. Secondly, in a preparatory phase, these experiences are evaluated and implemented systematically. For this purpose, schools set up laboratories or pilot courses. Thirdly, on a control level the school management develops strategies to spread the newly introduced concepts. Fourthly, on the level of integration those concepts are revised and adapted. Based on these findings of Nolan (1973), Kubicek and Breiter (1998) transmitted these considerations to the German school system. It is vital to schedule a longer period of time for such development processes (Fullan, 2001). Since introducing tablets at schools is a longer and transformational process, we have set a timeframe of four years for the accompanying research (2013-2017).

Regarding the research design, the survey focusses on teachers as well as students. The experiences and perspectives of both groups will be inquired through a quantitative survey via questionnaire and through qualitative individual interviews and group interviews. However, the hitherto existing results primarily reflect the *attitudes* and *subjective* perspectives of the respondents. Therefore, from 2014 onward, the study was methodically supplemented by video observations being collected as part of our research. Lessons are observed in grades 5 to 10 (students are about 10 to 16 years old) at all nine participating schools. In Germany, video observations are currently applied more often to collect data material. However, qualitative research offers only

limited access to well-proven methods to evaluate this data appropriately. Often, techniques for interpreting pictures are simply transmitted and applied. In this study, qualitative data is therefore interpreted using a combination of video analysis (Dinkelacker & Herrle, 2009; Reichertz & Englert, 2010), as well as structural hermeneutics (Aufenanger & Lenssen, 1986).

Regarding the underlying theories for analyzing the video sequences, the SAMR-model (Puentedura, 2006) is applied among others. It allows determining the way in which technology is integrated into the lessons. The model comprises four levels: Two lower levels (Substitution, Augmentation) and two higher levels (Modification, and Redefinition). At the lowest level (Substitution) the tablet acts as a direct replacement for an analog tool without leading to functional alterations. At the second stage (Augmentation) the tablet is also used as a direct replacement for an analog tool, but with functional improvements. These two lower levels are labeled as *enhancements* by Puentedura. However, the use of the device at these levels is by no means to be equated with an increase in the quality of teaching. It can rather be defined as an expansion of the possible ways of learning. The two upper levels, however, indicate a *transformation* of learning. At the third stage (Modification) the use of technology for example, allows a significant redesign of learning tasks and at the fourth level (Redefinition), the medium provides the possibility to assign tasks, which would not have been possible without the technology before. It may be criticized that SAMR is not a scientifically based model, but – due to its simplicity – it may be used quite well to reflect media didactics with teachers that just started using new technologies at school for their first time. Against this background, the model was adapted.

In evaluating the video observations, we analyzed single sequences in a first step and assigned the specific teaching situations to the levels of the SAMR-model in a second step. The model is geared towards a Revision of Bloom's Taxonomies (Anderson et al., 2001) and its ladder-shaped structure from a lower level (Substitution) to a high level (Redefinition). It allows to draw conclusions about the manner in which technical devices are being used in the classroom without making statements about the quality of teaching and learning success of the students. In a second step, hermeneutic video analysis (Aufenanger & Lenssen, 1986) is being used to evaluate whether it is possible to describe different forms of didactics and teaching culture in phases with and without the tablet.

Findings

As part of our research, the quantitative and qualitative surveys have shown that tablets in the classroom are not being used in a much different way than other tools [Table 1]. The main focus lies on using them as tools for acquiring information, followed by a more subject-focused use of certain apps. On the contrary, using the potential of digital media for communication, collaboration as well as documentation, in terms of e.g. taking teaching notes, can only rarely be found.

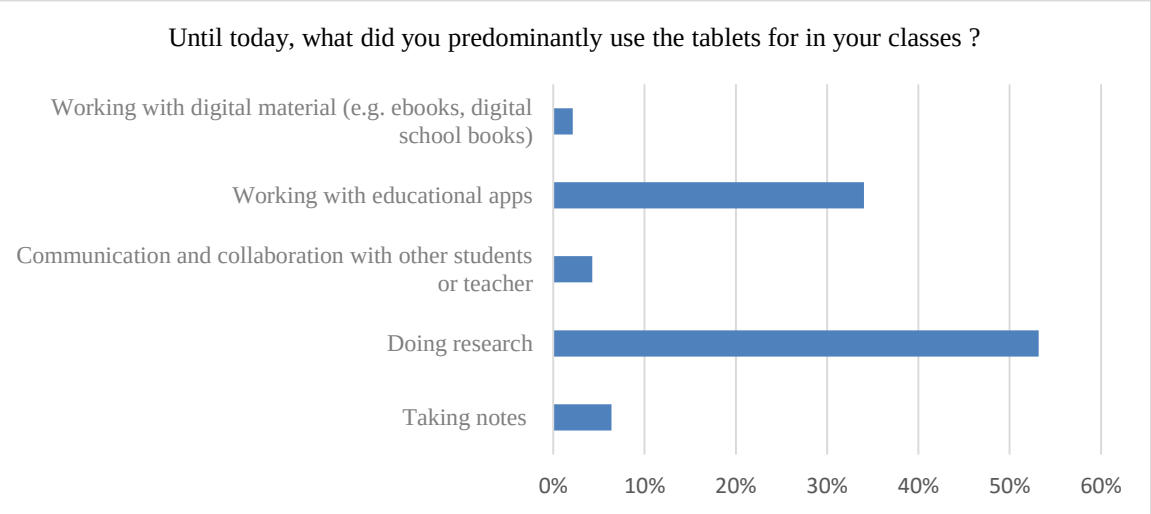

Table 1: Use of tablets in the classroom from the perspective of teachers (N=161; multiple selections)

Taking a look at the different modes of work tablets are being used for, it shows that they are mainly

applied for individual work or short-term project elaborations rather than using tablets for cooperation and collaboration through partner or group work [Table 2].

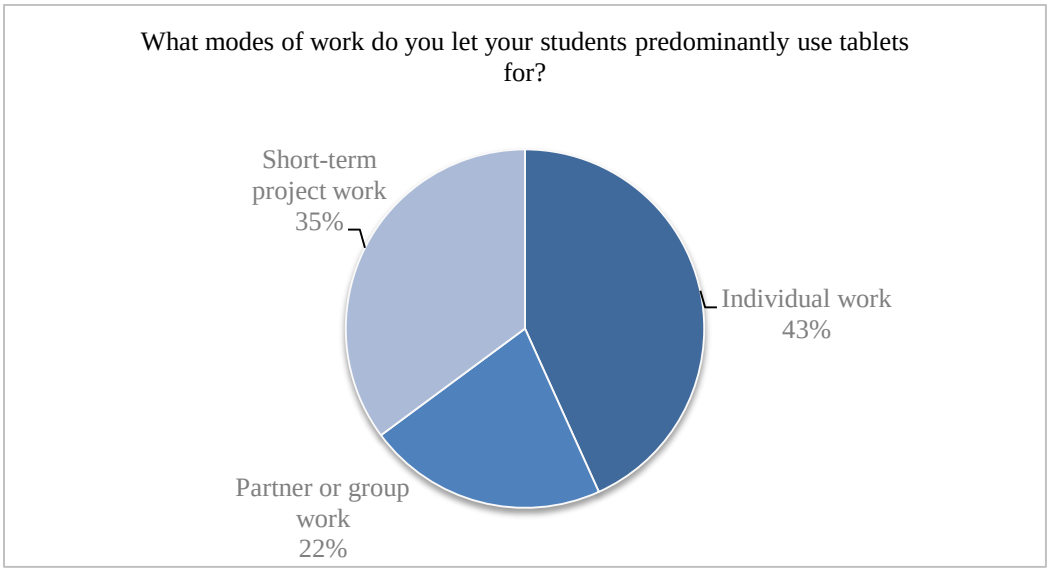

Table 2: Modes of work teachers choose when letting students work with tablets (N=69)

Regardless of these modes of work, there are various effects that can be shown regarding the use of tablets in the classroom. From students' perspective, the fact is being emphasized that by using tablets during lessons, learning becomes more varied and the motivation to participate is higher [Table 3]. Potential negative effects, however, are hardly supported.

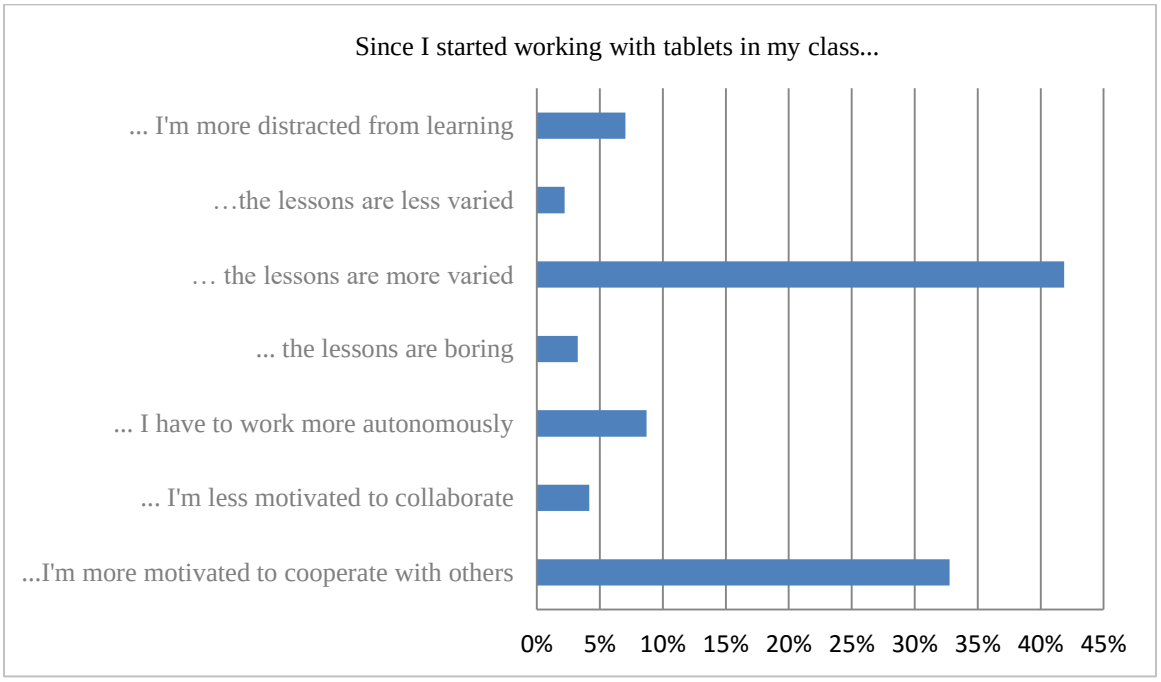

Table 3: Students evaluation of educational effects of tablet use in their classes (N=769; multiple selections)

The observation of lessons through video recordings serves to clarify whether the statements of teachers and students can also be observed in actual teaching. As part of our research, the use of tablets in the analyzed teaching sequences has been associated with the levels of the SAMR-model (Puentedura 2006).

It is noteworthy that an application in German schools in most cases still takes place on the lowest levels. Tablets are being used primarily to replace another application (lowest level: Substitution). In the

accompanied schools, this happens for example when an appropriate app is being used on the device instead of a graphical representation on a board, a text book, or a worksheet. Regularly, the use of tablets as simple tools for presentations has been observed.

The second level (Augmentation) can be found a slightly less frequent in the observed classroom settings. All situations in which the tablet has been used as a substitute for another tool, but with a functional improvement, have been evaluated as Augmentations. In the lessons observed, these situations are limited to the following:

- Using mathematical apps to visualize and analyze graphs and, thereby, developing a deeper understanding of mathematical functions.
- Undertaking classical research through a search engine with the effect that a huge variety of (up to date) content may be found.

In comparison to the lower levels of the model, tablets are being used at rare occasions only on the upper model levels. Cases in which the device leads to the redesign of a task were evaluated as Modifications. In the teaching sequences analyzed, such modifications could only be found twice. In one case a lesson was being observed, in which a city council meeting was simulated. Discussing the fictitious construction of a shopping center, the student groups were asked to gather information and collect arguments for and against it. One group journalistically accompanied the project. Using the tablet, they provided short video clips explaining relevant terms (e.g. *legally binding land-use plan*) to support the discussion by offering learning material. This way, the tablet led to the redesign of a task – the production of explanatory videos.

An actual Redefinition, in terms of using tablets for creating new tasks that were unthinkable without the technology, could only be found in two situations observed. This comes as a surprise and raises several questions: Which reasons can be found for the conservative use of technology in German schools? Does this finding also reflect international tendencies? Should it be the goal of such analysis to derive proposals for development opportunities and offer schools suggestions for change on the basis of examples from the lessons observed? It would be of great interest to evaluate, whether it is only a lack of knowledge about the educational potentials and capabilities of tablets that prevent German teachers from using the instrument for a Redefinition of learning.

The structure of the model implies the superiority of the highest level, Redefinition, as well as the necessity to transform and redefine learning in the 21st-century classroom. Nevertheless, it is important to point out that every level, whether it is a Substitution or a Modification, has to be evaluated as equally legitimate within the model. From a pedagogical point of view, it is the small variety of levels used that needs to be criticized. The goal is not to redefine all didactic situations at once, but to enlarge the variety.

Conclusions

Looking at the findings from the perspective of a recent German methodical-methodological discussion, the question arises, if in addition to innovative teaching concepts innovative research methods might be necessary to explore the topic adequately (see e.g. Welling, 2016). In most cases, the study design is average and the methods being used are well-established. Repeatedly, mainly simple effects such as the handling of certain aspects through various players in the project (e. g. the acquisition of required media competence) or the corresponding attitudes are being tested (Kuckartz, 2010). So far, it is an open question if new study designs as well as corresponding methodical and methodological integration are required to research phenomena associated with tablet use by learners and teachers adequately.

Within the framework of the project "Paducation" (Welling et al., 2015) already mentioned, the question of an appropriate methodology is being raised, against the background of new phenomena reconstructed within the research process: for example adolescents consistently report that during the course of the project, communication via media has greatly intensified through the use of tablets which had a significant impact on learning, *bildung*, and other social processes. However, the question is what kind of methodological orientations are adequate to explore the use of tablets in school environments and other educational contexts? Is videography a tool that gives us new insights compared to the reiteration of surveys and interviews?

On the other hand, it might be beneficial to take a closer look on tablets regarding their “materiality” and their meaning for learning processes. Especially regarding the fact that there are significant gaps in research regarding the pedagogical relevance of “things” as well as the intensification of the use of such devices, these issues are becoming increasingly relevant. Therefore, Nohl (2011) conceptualized a “pedagogy of things” which might be a point of reference regarding the methodical-methodological innovation potential for empirical

research. His model of socialization in conjunctive, organized, and institutionalized transaction spaces (Nohl, 2013) in combination with practical considerations for mobile learning by focusing on the materiality of these processes (Enriquez, 2013; Merchant, 2012), might be particularly useful.

In both qualitative and quantitative empirical surveys, mostly oral or standardized written surveys are being conducted. Other forms of data collection, e. g. video observations, are only performed at rare intervals. This inevitably leads to the tendency of describing the use of tablets from a more personal perspective by the user rather than describing the actual usage itself. The results of the present study show that although tablets may increase learning motivation, they do not necessarily lead to changes in teaching and learning. Therefore, it is – and not only in Germany, but also internationally – necessary to open a critical discussion whether surveys constitute an adequate evaluation methodology. Video observations might provide new insights into the nature of actual media usage.

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