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The Educational Impact of Digital Storytelling on Learning Support and Competence Development

Summary of (PhD) Thesis

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1. The topic of the PhD thesis

Since the turn of the millennium, there are more and more digital devices at the schools of Hungary, however, the teachers use them mostly as a tool of illustration and administration, and - though they are open to learn new teaching methods -for now they know little strategy, in which the use of ICT tools based on learners' activity can be integrated (*Buda,* 2017).

Digital Storytelling (hereinafter referred to as DST) is a creative method, which was transferred from the world of community art into education as a complex teaching and learning strategy at the turn of the millennium. It includes a methodological framework for the use of ICT tools, supports the activity, creativity and cooperation of students and promotes deeper knowledge acquisition through the use of the narrative structure.

The topic of the dissertation is to examine the effects of DST in the teaching-learning process and in activities outside of school. The theoretical background of DST was mapped, and the possible condition of its applicability was explored by synthesizing international research results. An important part of the thesis is the presentation of an empirical research in the Hungarian public K-12-education system.

The aim of the study was to get a better understanding of the applicability and impact of DST. The research aimed to answer the questions of how the learning process can be supported by DST in different educational areas and in different age groups of students. We also sought to find out, whether the effect of the DST on student achievement and the development of each student's abilities, with particular regard to writing, reading, listening skills and digital competence, can be detected. While analyzing the effectiveness of DST, the complex system of the pedagogical practice was taken into account. The characteristics of students' and teachers' activities and the classroom management were also examined by their effect on the students' skills and the quality of the digital stories.

2. The theoretical framework of the research

In the first part of the thesis the interdisciplinary approaches of storytelling, which plays an important role in human cognition and communication, were summarized. We examined with the help of the terms of the narrative psychology (*Bruner*, 2001; *Bruner*, 2004; *Pléh*, 2012), the theory of cultural evolution (*Tomasello,* 2002; Donald, 2011; *Komenczi*, 2014) and the narratology (*Propp*, 1999), why and how human beings use the narrative model to transfer information. Using the terms of media theory (*Meyrowitz*, 2003, *Goldhaber*, 2004; *Ong*, 2010) we revealed, how the current media environment as the channel of narrative information transmission has evolved over time.

The history, methodology and definitions of the DST were placed in this theoretical framework. The DST method is an art-based method with a short-narrated-filmmaking process, which was developed by Lambert and Atchley in the *Center for Digital Storytelling* (today *StoryCenter*) in the early '90s in San Francisco. It combines the story-writing with the newest digital technologies and multimedia tools. Individuals can tell their personal stories from different perspectives with the help of still or moving images, sound and narrative voice. The last step of the process is the projection, (*Lambert*, 2002/2013).

In the curriculum called *California model* the different steps of the method show how to make a digital story through continuous discourse with peers and the facilitator, and how to record own voice and use video editing software. The last step of the procedure is the presentation of videos, after which the participants evaluate each other's production and the whole process (*Lambert,* 2002/2013). The dissertation is based on the DST definition of *Lambert* (2002/2013), *Meadows* (2003), *Robin* (2011) and *Ohler* (2013). According to this definition, DST is a *coversmodel* that enables *interpersona*l *interactions and individual creative activities through digital device usage*, which has a result *of a 2-5 minute video with own voice, still images and text.* DST is distinguished from the traditional forms of storytelling by the creative process *based on California model* and the resulting creation which is called a digital story.

The DST methodology was used by many disciplines of applied sciences. *Barber* and *Siemens* (2016) connected the humanities and DST find that the DST methodology is able to assist the researchers in collaborative thinking and creation. The digital story, however reflects the specific social relations of the current age. Narratology explores the revealing of the visual and verbal message of the digital stories *(Porto* and *Alonso-Belmonte*, 2014). The product and the process can be the subject of sociological inquiries as well. There are good examples of the use of DST in the field of intercultural communication (*Smeda*, *Dakich* and *Sharda*, 2014), training of helpers *(Stacey* and *Hardy,* 2011), but it can be used in participatory theater training (*Horvath, Oblath, Lanszki, Teszáry*, *Csoszó* and *Weaver*, 2017) and also in therapeutic group sessions (*Willis Frewin, Miller, Dzive*, *Mavhu* and *Cowan,* 2014). *Eglinton*, *Gubrium* and *Wexler* (2017) used DST as a qualitative and transformative, arts-based research tool, but DST plays an important role in maintaining social memory as well *(High,* 2014).

One of the main applied sciences of DST is science education, which is thematized in the last chapter in the theoretical part of the thesis. DST is a complex teaching-learning strategy, and as such, can be interpreted in the system of educational paradigms. These

didactic systems are not mutually exclusive, but are based on an interdependent, mosaic-like system (Figure 1).

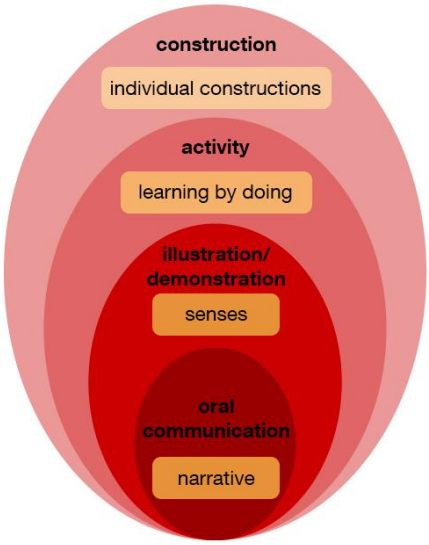

Figure 1:DST in the view of pedagogical paradigms (my own figure)

In the innermost core of the onion model is the paradigm of oral knowledge-transfer, which is still present in today's schools, especially - if we broadly interpret this paradigm - in the text-reproduction and the learning with the narrative scheme. The paradigm of illustration is clearly identified in the DST, a number of educational projects demonstrate subject content with a digital story. The paradigm of learning by doing is based on the student's activity, it can be also detected in the complexity of DST, because the process allows the active participation of students in the teaching-learning process. The DST can also be interpreted using the constructivist epistemological principles, because the teacher does not pass the vertical information-transfer, but the students create their own knowledge-construction relevant to them within the theme.

Understanding DST as a learning and teaching strategy, we described the didactic features along the following categories: 1) design, 2) the steps of DST, 3) educational goals - the genres of digital stories, 4) student activities, 5) learning environment, 6) social forms and methods, 7) learning tools, 8) evaluation of digital stories, 9) challenges. The role of the teacher was explored using the TPACK model *(Mishra and Koehler,* 2006).

In addition, empirical research has been examined the impact of DST in various educational contexts, whether the students' competency areas, the cognitive and emotional-affective factors of the proceedings on students' performance (*Barrett,* 2006; *Sadik,* 2008; *Xu*, *Park* and *Baek,* 2011; *Karakoyun* and *Yapıcı,* 2016). DST promotes the formation of intintristic motivation (*Sadik,* 2008), because the students work for the creative experience.

The theoretical opportunities of the learning-support effect of DST were relieved by Bloom's taxonomy.

At the end of the theoretical chapters, we consider the areas of pedagogical applicability of DST based on international literature. In the native and foreign language classes, DST primarily serves to improve the ability of the students writing, listening-, and reading-comprehension skills, and also plays an important role in their vocabulary extension as well as is their oral communication development (*Xu* et al, 2011; *Green,* 2011).

The applicability of DST is plausible in the case of the thematization of all subjects of social sciences in which there is a legitimate interest in the appearance of personal narratives, thus also in the teaching of history and citizenship (*Bou-Franch,* 2012). The positive aspects of DST can also be used in the teaching of mathematics and natural sciences, the digital stories in this case build on students' physical perceptions and environmental experiences, preliminary subject knowledge, and new information on the textbook and on the Internet (*Sadik*, 2008). But DST is also beneficial for the education of the arts and the education of students with special educational needs (*Michalski*, *Hodges* and *Banister*, 2005).

3. The empirical research

The research named "Digital Storytelling in the Educational Process" was conducted in spring of 2017. In the empirical research we sought to find out how the learning process can be supported by DST in the public K-12-education in different educational areas for each age group of students, and the impact of the different classroom management strategies of DST on each the students' skills with the different didactic conditions of usage.

The intervention, in which DST was integrated into the curriculum, took place in the second half of 2016/2017, facilitating teachers who previously had an online methodology training of DST by an open online course was taught by the researcher. The 25 study groups participating in the study made videos related to their subject topics with DST on 8 subject areas based on the content elements of the MOOC modules, i.e. the California model's actions, paying attention to the search for legal content and references to sources.

3.1 Sample and research methods

During the selection of research methods and tools we followed the principle of methodological triangulation, quantitative measurements were supplemented by qualitative examination. Data was obtained before, during and after the intervention (Table 1). The

students (N=443) participated anonymously in the study, the data were identificated with help of student codes.

Table 1: The "Digital storytelling in the educational process" research - measurement areas, measurement types and methods of data collection

Study area	Type of measurment	Data collection method
Input and output measurements		
Reading	Skills measurements	paper-based, according to the students' school degree, based on national textbook publishers exercises and assessment criteria
Listening	Skills measurements	paper-based, proprietary asset
Writing	Skills measurements	paper-based, age-appropriate subjects - based on essay writing criteria of *Education Authority*
Achievment in the subject	Knowledge level measurement	paper-based, according to the students' school degree, based on national textbook publishers exercises and assessment criteria
Data Acquisition before and after the DST		
Digital literacy	Written questioning	online questionnaires, based on *the model of Digital Citizenship, 2017* (*Papp-Danka* and *Lanszki*, 2017)
In the process		
Teaching style, classroom interactions, organizational forms	Observation	9-point assessment scale based on national educational supervision aspects for elementary school and high school (2017)
After the process		
Evaluation of digital stories	Analysis of videos, CAT technique (*Amabile,*1982)	assessment scale: based on criteria *Ohler* (2013) and *Yamaç* (2015)from more system
Educators reflections	Content analysis	case studies,(as a guide)
Students reflections	Written interview and content analysis	online questionnaire: 5-point assessment scale and open-ended questions

Measurements were organized in school's circumstances, and students had to fill the tests anonymously. The process was approved by the parents and school leaders.

The measurements listed in Table 1 were followed by a protocol that was discussed in advance with the DST facilitator pedagogue.

3.2 Research Questions

The first research question relates to whether DST causes a detectable change in the students' skills of reading, listening and writing, or whether the students' performance is affected by learning a thematic unit with DST at school.

In further research questions we have going to focus on what didactic factors affect the changes in learners' competences and the success of DST. During the analysis of hypotheses, I use the term "change of students' competences", for the development of their writing, reading and listening skills. The other term "success of the DST-process" means the score-value of the students' digital stories, which is due to the basis of the evaluation by two independent experts (see below: measuring devices).

3.3 Results

The quantitative data allowed the mathematical-statistical-based analysis of the hypotheses, and the qualitative data were analyzed by content analysis. Along the research questions, the following results were obtained:

3.3.1 Impact of DST on students' writing, listening, reading skills and subject achievement

Teachers argue that DST is a good way to expand knowledge, and learners also thought it would both support the acquisition of new contents, lexical items and synthesize existing ones.

However, the efficiency of DST on improvement of student's achievement could not be detected in any case. This is partly due to the fact that the subject knowledge tests have measured different constructs for each subject and topic, on the other hand, the students' performance can be evaluated in grades and percentages, and the tendency can be measured only in longer terms. This result can therefore be interpreted in a limited way.

According to teachers involved in the study, DST supported the development of students' reading, writing and listening skills. During the hypothesis testing process we managed to justify that the DST contributed to the increase of students' progress in these competencies. Interpretations and construction of visual and verbal texts were not independent, self-contained activities in the learning process, but also complement to each other, as part of digital story creation. The students actively contributed to the development of their own skills, not only in the text creation, but also in the interpretation and edition of audio and video texts. For the students the biggest difficulties were the writing and editing of

audio and video materials, however, they fought for the task to create a digital story, and at the end of the process, it was considered the biggest development in these areas. The strongest effect of DST was observed by the improvement of students' writing and reading skills.

3.3.2 Teacher characteristics and DST

The development of reading and writing skills by DST does not depend on the attitude of teachers' motivation and problem-solving rate. The number of the years spent on teaching has no effect on the success of the application of DST either. Only few teacher characteristics show a correlation with the development of individual student competences and film scores.

Those student, whose educator taught them without any differentiation, achieved better results in the development of listening skills. It is likely to be because those stages of DST, which are associated with the individual and cooperative workform, improve the listening comprehension skills.

The teachers have a key role in developing the students' reading skills by their continuous feed-backs and helping by interpreting, discussing of resources and correcting students' written texts. Three further teacher characteristics took a positive effect on students reading skill: a methodologically well-prepared teaching style, interactive communicating and the ability of reserve the students' attention. The development of students' writing skill also depended on teachers' methodology, and his/her lesson planning awareness influenced the development of text-creation skills as well.

Text writing, which was considered to be the most difficult by the students, was positively influenced, if the teacher supported the pupils both in and outside the contact hours and classroom hours. The teachers' conversational, interactive feedback had a positive impact on the quality of digital stories. Students, who took part in the whole DST process at school, received higher scores for their videos. However, it also had a positive effect on the quality of digital stories, when the students could edit their videos as homework without the help of their instructor. Those students, who worked alone, or students group who worked together in a collaborative form, achieved better results by making their activities outside the classroom than in inside.

3.3.3 Learning Management Forms and DST

The higher the contact number of lessons students dealt with the DST, the more developed their writing and listening skills, and the more successfully they prepared their digital story.

This is due to the several constructive educational dialogues with the teacher and student peers.

Students made their digital history individually, in pairs or in small groups, and a group of students made a common movie. The dominant form for high school students was the individual work. The learning pairs of students with heterogeneous capabilities could co-operate the most optimally, as opposed to randomly formed formations. Teachers had to pay attention to the balanced the student division of labor and the constructive and civilized discussion style of the students.

For elementary school students, teachers tried to maintain the contact lessons between the frames of their official curricula, but high school students completed some activities as homework tasks.

The listening comprehension effect was further influenced by the fact that the learner did not only deal with DST at school but also at home as the student was able to listen to text that was terminated during video editing in quiet conditions even more than once. Improving digital stories at home also had a positive effect on the quality of the videos. Teachers could not always manage to organize the lessons in a computer room, so those students who were able to deal with their home at home had a better result.

Several students group's work were supported by an online platform of the class, which offered opportunities for communication and content sharing even outside of school. It had a positive impact on the students' writing skill development, however, it did not affect the quality of the digital story.

The individual work form supported the improvement of writing and reading skills better, but the digital stories produced in small groups gained better quality.

3.3.4 Student characteristics and DST

The hypothesis testing revealed, that students with higher socioeconomic status produced a higher quality digital story. The DST method is based on using digital devices. Students with worse financial position do not have a desktop computer or mobile device with Internet-connection at home, that prevents them to improve their digital stories under home conditions.

Students with learning difficulties were a very small part of the sample, so we could not analyse their by mathematical statistics-based comparative tests. Nevertheless, during the examination of the learning organization forms it revealed that in a special education classroom, we observed a significant positive change in the development of writing. Teachers

who are not taught in segregated classes, stated in their case study that more energy investments needed from both the learner and the teacher during the process of DST, if students with learning difficulties participate in the process.

According to the teachers' opinion the introverted students were fearlessly manifested through digital stories, they were better to show their skills, their knowledge in the learning community through the medium of film than in other classroom interactions.

Students' digital tools usage preferences had no effect on the development of students' skills by DST, or on the quality of digital stories. The type of tools they use, the method of their digital device employing, and the degree of their digital tool operation in an out-of - school environment had no impact on the effectiveness of DST. The students mostly used their digital mobile phones to play and chat with friends. They did not used these assets to support learning, only for searching some information. Only a small minority of students used their digital tools productively. The students usually do not use their digital devices for doing creative activities, they had only little routine in taking photos and recording sound with their phones. It was the first time they have learnt about the method of searching for legal pictures, editing images in different media formats (text, audio and video), therefore, their previous digital device usage had had less impact on the effectiveness of DST than the application of the institution's assets.

However, we have found, that DST affected students' digital competence in several fields. Their digital literacy has been expanded, their information and media literacy has changed positively, there has been an overwhelming knowledge about integrating and rebuilding content, and last but not least, their collaboration, communication and digital content creation.

The students felt themselves more comfortable during the DST- lesson than in traditional classes. Half of the students said that the DST method makes learning easier but the other claimed that the traditional teaching methods are more helpful in learning.

Students who liked more the traditional teaching forms argued that the traditional form of learning takes less time and that they need textbooks and the recent intensive presence of teachers. Some students felt unpleasant to listen to their own voice, too.

For students, who voted for DST this strategy is easier, because it provides a more attractive framework for learning than the traditional frontal method, and the visual communication and the digital assets helped them to acquire knowledge better.

It was also positive for the students to participate actively in the knowledge construction, and they also liked, that they could be creative and free in content processing and expression.

According to the narrative of teachers we observed two kinds of patterns in students' motivation. The high school students' enthusiasm increased gradually. Primary school pupils were very enthusiastic about the method in the introducing class, but during difficult stages like writing, voice recording and video editing, their motivation halted. Amid the screening they were enthusiastic again and they watched each other's creations very proudly. Based on student feedback, we found that these processes were difficult for students, but they considered them to be necessary. Moreover the satisfaction surveys shows, that their competences produced the greatest improvement in these three fields. Their coping ability has also improved. Generally speaking, most of the students enjoyed the screening and editing of videos, least of all enjoyed the summarizing of texts and the teachers' presentation about Creative Commons.

According to the teachers' opinion, the DST has helped the students to deepen their self-knowledge, and improve their self-esteem. In addition, as the entire process was characterized by dialogical and cooperative analyses and these procedures developed students debate skills, critical thinking, and the sense of responsibility for both own and each other's products. Although the cooperation was not always conflict-free, because the students had to collide their interests and opinions, the pupils and teachers have said it was the greatest experience for them. The students felt that their readiness for cooperation has improved by consolidating their strength, subdividing their assigned work phases with each other and discussing the progress and the quality of the product, as well. Teachers also felt part of the students' cooperation, they get better acquainted with their students. According to the teachers the community-building power of DST is significant.

3.3.5 Subject, grade and DST

DST had positive effect on the writing competence of more than half of the measured elementary school students, this progress is stronger than with their high school peers. However, the primary school pupils achieved lower scores averages for their videos as the high school students. The results of the elementary school students were traced back to the facts, that they put more focus on writing because it was a bigger challenge for them. They discussed and repaired the texts with fellow students and their teacher repeatedly, which has contributed to an improvement in the dynamic drafting of their writing skill. However, their

usage of digital devices was unacquainted, searching, storing, sharing, reusing of data consumed more energy in their case. For high school students the writing and the data management were minor challenges, therefore they had more energy left for the technical execution of the digital stories. They put more emphasis on video editing, they were more motivated during it, as in the text creation. During the hypothesis examination, it was found that among significantly more secondary school students' listening skill was developed with DST than the number of primary school students. In addition, data synthesis was easier for them, and high school students improved their reading comprehension rates more than primary school pupils.

In the case of different subjects, there is no noticeable deviation in the field of ability development. In the field of human subjects, more than half of students' listening skills have developed, the positive impact of DST on writing ability and written text is slightly stronger in human subjects than in science subjects. Regarding the quality of digital stories, we can conclude that at the end of DST within the science subjects, students achieved higher scores than in human subjects.

3.3.6 Challenges

The students and their teachers faced challenges in two interconnected areas: one is time management, and the other is difficulties in using of technology.

Workstations of DST requiring digital access were partially or fully implemented in schools. Taking photography's and voice recording were solved by using students own mobile devices, but they needed desktops with Internet to search resources and to edit their videos. These activities cannot be switched by BYOD (*Bring Your Own Devices*) approach, especially in case of video cuttings, which is easier to do on a desktop computer using mouse and headphones than on mobile devices.

The DST process was greatly hindered by the technology-related inconveniences. At the beginning and during the actual creation, students had to face a number of issues related to the inadequate functioning of institutional IT tools and the Internet. However, the utilization of IT rooms at schools is high, and non-IT educators can only access in this classroom with difficulty or through classroom exchange.

Solving technological and administrative problems has taken the focus of creative processes in several classes, and the technological problem solving increased significantly the amount of time would spend on DST. This was especially problematic in the case when the teacher taught her class only in low weekly classes, so she had to "ask" other classes

(typically drawing and informatics) from her colleagues. The other bridging solution was that the students had to finish the work at home, which was problematic. On the one hand, the students had spent the majority of their afternoon hours on other subjects and leisure activities instead of DST, and on the other hand the teacher could not expect from all students to have computers with Internet connection at home. DST is therefore a process that can only be carried out with optimal school supplies.

Both students and their teachers believed that DST was a highly time-consuming process, which is certainly due to the struggle with technological barriers. Nevertheless, several teachers have reported that later DST process took significantly less time than the first attempt. Teachers who tried DST have a vision for the sequel, and instructors who have not done yet, plan to apply DST to other learning groups as well.

4. The significance of research

The didactic conditions and the effect system of the application of DST in pedagogical processes have been discovered. Compared to previous DST-related researches, the empirical research entitled "Digital Storytelling in the Educational Process" has brought many new results. DST should be used in any age group of students, for any subject, as it develops the writing, listening and reading skills, the digital literacy of the students, as well as the student's cooperation and discussion skills. Through the creation, students learn about themselves and their students more deeply, and on the other hand, they are responsible for creating a product for themselves and their community. During this process, they develop their written and oral communication skills both in online and offline learning environments.

In order to achieve the optimal learning support effect of DST, we have put forward recommendations that can be used in pedagogical practice.

5. Limitations, further research directions

When designing the research, we were aware that the success of this complex strategy was difficult to grasp, and even more difficult is to assess its effectiveness. In determining the success of the DST, the record number was regarded as a graspable construct, which cannot be determined solely by the scores of the produced films. In the further research, we need to establish the criteria describing the success of DST more accurately, and also work on a more objective evaluation system for the whole DST process.

In this research, the measurement of the achievement level of students in several subjects was also problematic. We selected national publisher’s tests to measure the level of

knowledge on subject contents, but there were big differences among the tests in different topics and in the various subject areas: parts of them were mainly verified to knowledge acquisition while others were competence-based tests. All of these circumstances significantly reduced the reliability of the data we received and thus the results of the student's change in subject achievement. It is a very important objective in our further research to develop a more uniform, more sensitive measurement template for this area.

We also want to improve the measurement of students' listening skill based on the examples of the of foreign language teaching, in order to make many aspects of this competence to be studied.

In addition to the quality assurance aspects of DST's efficiency and effectiveness, the development of a complex new methodological and analytical tool repertoire will be the continuation of post-thesis research.

In our next research, we want to minimize the loss of data by the measurement process, which we want to achieve by taking the data collection in- and output measurement once, rather than fragmented in time, in several steps.

In addition to the improvement of the measuring tool and the measurement process, we plan to carry out a longitudinal research. In the first round we are going to try to find the students who participated in this research and ask about the content that was processed with DST, examining how they have been able to store these knowledge. The other direction of the research will be the area of self-regulating learning and DST.

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