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Storytelling digitalization as a design thinking process in educational context

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This paper is supported by two pillars which are both significant research areas in contemporary literature. The first one is Digital Storytelling, especially when utilized as a teaching approach. The creation of a digital story, regardless of the media format used, follows specific intermediate steps. The second pillar is Design Thinking (DT) which is lately gaining momentum as a teaching strategy, involving problem solving approaches through a series of interconnected steps. In this paper, a correlation of the necessary steps for creating a digital story, especially in the context of education, with the core steps of the DT process is made in order to highlight how similar these approaches are, considering that they rely on problem-solving. The goal is to demonstrate their similarities, thus highlighting their similar educational value and stressing out the fact that storytelling can be utilized as a DT methodology for teaching.

1. INTRODUCTION

Several innovative teaching and learning approaches have emerged over the past years, especially ones utilising technology. Teaching strategies are nowadays more student-oriented, shifting from designing learning material to designing learning situations/opportunities. Education is changing, focusing on competences which are analysed into Knowledge, Skills and Attitudes (Redecker et al., 2010). Such recently emerged approaches are those of Digital Storytelling (DS) and Design Thinking (DT) which both incorporate the design and implementation of a solution to a given problem/situation. Both approaches integrate specific step series to be followed in order to meet the pre-set goal which is the implementation of the final product, namely a digital story or an artefact.

In this paper, the similarities of these two approaches in matters of intermediate steps are examined. The underlying idea is to demonstrate how actually digital story creation can be considered as a DT process, thus further highlighting the advantages of the educational utilization of DS. A step by step correlation will demonstrate the task similarities in each step and ideas of task integration are to be discussed hereinafter. The paper is structured as follows: initially the two approaches are discussed, focusing on terminology and conceptual description. Then, a step by step correlation is made in order to highlight their similarities, before the concluding discussion.

2. DIGITAL STORYTELLING

Storytelling “has been around” as long as humans exist. It is one of the oldest communication and learning methods. For many years, societal key principles have been taught through storytelling (MacDonald, 1998), including culture, values, and history (Egan, 1989). Stories have been used and still are used to convey information or motivate colleagues or friends (McDury & Alterio, 2003) but also help make meaning out of experience (Schank, 1990; Abrahamson, 1998) and convey values of a culture (Bruner, 1991). They also help build

connections with prior knowledge and improve memory (Schank, 1990). As a result, good stories are easily remembered (Rex et al., 2002).

DS is the combination of traditional, oral narration with multimedia and communication tools. It is a form of art which combines different types of multimedia material, including images, text, video clips, audio narration and music, to tell a short story on a particular topic or theme (Robin and McNeil, 2012). Learning theorists claim that storytelling can be utilized as a pedagogical technique/approach effectively to nearly any subject and in all levels (Pedersen, 1995). In the case of digital stories, they can be created by teachers and/or students. As educational material, digital stories can serve as a way to present new material and capture students' attention (Robin, 2008). Furthermore, they can facilitate students' interaction and make content more understandable (Burmark, 2004). Via the internet and cloud services, students can utilize digital stories in order to express thoughts, ideas and opinions while sharing them with a wider audience. They can also improve their writing skills when creating their own stories (Gakhar and Tompson, 2007). They also become more active and productive in individual or collaborative communication activities (Bratitsis et al. 2012). With advanced technologies, digital stories can be exploited in various educational contexts following a very innovative approach (Bratitsis et al., 2015; 2017),

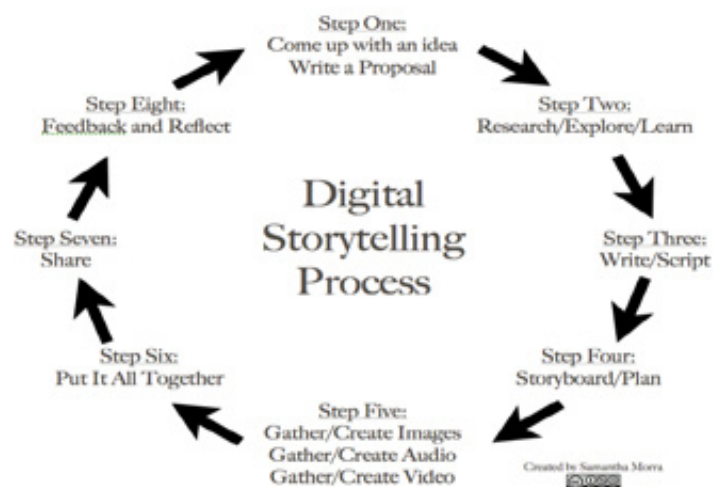


Figure 1: The Digital Storytelling Process (Morra, nd).

The creation of a digital story, regardless of the context, follows a series of intermediate steps. Many descriptions of the process can be found in the literature and within numerous of professionally conducted workshops, worldwide. The schematic diagram in Figure 1 consists of 8 steps and is one of the most commonly accepted descriptions of the DS process. Similar diagrams are available in the literature, varying mainly from 7 to 8 steps. Lambert (2013) one of the pioneers in DS, described 7 steps in the digital story creation: 1) Owning your insights, 2) Owning your emotions, 3) Finding the moment, 4) Seeing your story, 5) Hearing your story, 6) Assembling your story, and 6) Sharing your story. Examining these two sequences, the similarities are apparent. One has to be inspired, think of and design a story. Sometimes this involves research for further information. Then the digital version of the story should be designed, digital material should be created and/or gathered in order to be structured (storyboard creation). Then the digital story is to be created and shared, leading to potential feedback collection and evaluation of whether the initial goal is met. In the case of Lambert's 7 steps, the first 3 steps are about creating

the story, steps 4 and 5 are about designing the digital version, step 6 about creating it and step 7 about sharing it.

Returning to Figure 1 which is a more elaborate diagram, these steps actually comprise in even less sub-tasks of the digital story creation process, namely: a) envisioning the story, b) elaborating on the idea and writing the story, c) designing the digital version, d) implementing the digital version, and e) sharing the story and reflecting upon it through feedback. In some cases these tasks fall under three distinct phases, Pre-production, Production and Post-production (Figure 2).

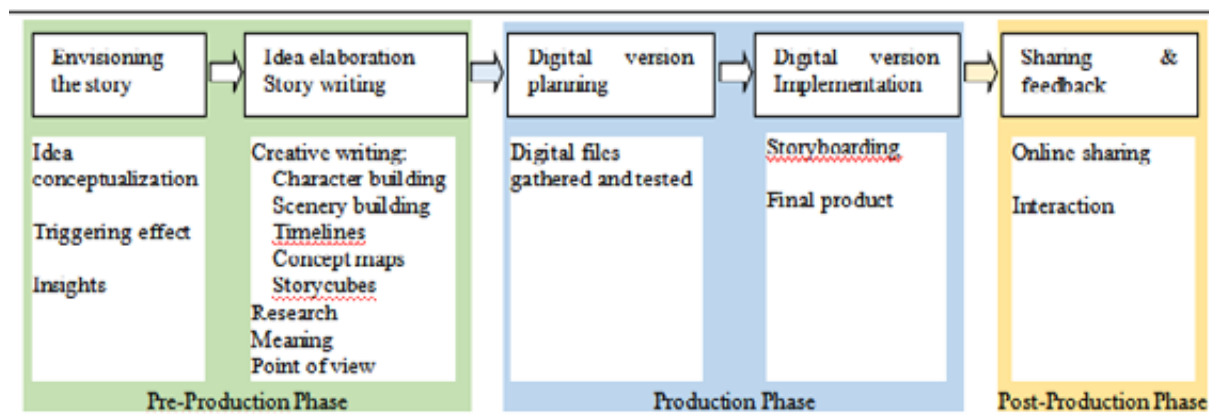


Figure 2: Phases and tasks of the digital story creation process.

The first task in Figure 2 refers to the conception of the project idea. It is about why and when someone would want to tell a story and about what. In the second task, this idea needs to be further elaborated so that the story can be written. This involves research (e.g. in the case of historical facts), selection of the point of view which will serve the story. For a narrative to be constructed and effectively communicated one needs to think carefully about the topic and the audience's perspective. Both listeners and narrators have the opportunity to develop their personal and narrative speech, to represent their knowledge, to present their story and receive feedback (Coventry, 2008). Thus, an understanding of the full meaning that the teller wishes to convey through the story. Several techniques can be utilized in order to design characters, scenes, plot and all the elements of the story, often following the Creative Writing approach (an indicative sample is presented in Figure 2). After all, "A story might be defined as a series of sentences that describe some sequence of actions, events or experiences, usually related to people as actors in the story. People depicted as characters in a story are usually presented in some characteristic human situations to which – together with the factors and changes which affect that situation from outside – they react and change it. With the development of the story, these adaptations and changes both of the situation and characters reveal to the follower of a story hitherto hidden aspects of the original situation and of the characters and expose a certain predicament that calls for an action or a change that would solve it." [18]. Proceeding to the Production phase, digital image and sound files should be collected and organized, paying attention to royalties and other technical aspects. Then the story is converted to a script and a storyboard is to be created, before the final product can be created. Finally, in the post-Production phase, the digital story can be shared and feedback can be collected through online social interaction, if that was the aim of the storyteller in the beginning.

Overall, DS is a very creative process. The potential social interaction after publishing a story increases the possibility for releasing improved/modified versions of a story, depending on whether the goals initially set were met or not. This is a fundamental difference between traditional and DS.

3. DESIGN THINKING

Design Thinking was initially introduced in the entrepreneurial sector, regarding product design and implementation. The term refers to a method for the practical, creative problems' solution using the strategies designers use while designing (Brown, 2008). It is a solution-based approach to solving problems, extremely useful in tackling complex, ill-defined or unknown problems. The core of DT refers to how designers see and thus how they think (Liu, 1996). It is a process of iterative steps through which designers: a) conceptualize a problem via some sort of representation, b) examine relations ideas in order to reach possible solutions, and c) reflect upon these drawings in order to enhance their design efforts (Do & Gross, 2001; Lloyd & Scott, 1995). For Braha & Reich (2003) the design process is a generic one where designers modify designs, requirements or specifications based on new, incoming information. Through many iterations, discrepancies are removed and a solution is pursued. Dorner (1999) describes three forms of thinking which emerge within the design process and Owen (2007) describes several characteristics of a design thinker, which Razzouk & Shute (2012) attempted to summarize in order to propose a DT competency model.

In general, DT refers to a systematic but also iterative process of solving problems (Cross, 2011). Usually a design-related problem serves as a starting point for exploration. From that point on, the problem and the solution usually develop together (Razzouk & Shute, 2012). Opposite to analytical/scientific thinking, DT is about introducing ideas through a brainstorming phase with few or no limits (Robson, 2002). This way, fear of failure is reduced and eventually thinking horizons are broadened. DT's focus is rooted on research which clearly demonstrates that the competences in the core of the DT mindset are critical to the integral development of learners and to their success.

As an educational tool, DT allows educators and learners to organize and facilitate learning experiences based on transdisciplinary approaches, supported by project-based learning and boosting the need to incorporate and put in practice knowledge from different fields of study to deliver a shared solution to a given problem. DT enables students to work successfully in multi-disciplinary teams and enact positive, design-led change in the world (Lindberg et al., 2009). Ray (2012) claims that by working in such activities within small group projects, students learn to collaborate, communicate and become open to questions and constructive feedback.

Several models incorporating several steps can be found in the literature for the DT process (Figure 4). Although the first model proposed by Herbert Simon incorporated 7 steps, one of the most well-know is the dSchool model, by Stanford University, which comprises in the following steps: empathy, define, ideate, prototype, and test (Figure 3 presents a modified version).

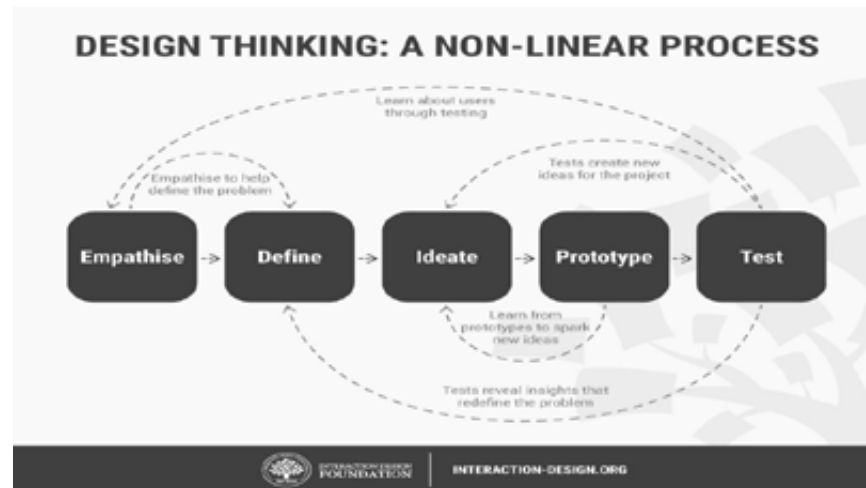


Figure 3: Non-linear iterations of steps within the Design Thinking process (Dam & Siang, 2018).

The first step is to understand the problem to be solved via an empathic approach. This may involve research, discussions/interviews with experts, observation and other means of acquiring information in order to fully understand all aspects of the problem. In such human-centred approaches, empathy is crucial as it allows the design thinkers to overcome their own assumptions and gain alternative insights. At this step, significant information is gathered, only to be used in subsequent steps.

In step 2 Information for the step 1 is analysed and synthesized in order to Define the problem to be solved. Often the term “problem statement” is more appropriate than simply a “problem”, as it can be rather abstract and conceptual. Usually this problem definition needs to be human-centred, taking into account the end user of the final product. An indicative example is (Dam & Siang, 2018) to use “teenage girls need to eat nutritious food in order to thrive, be healthy and grow”, instead of “we need to increase our food-product market share among young teenage girls by 5%”. In the first case the end user (teenage girls) is the center and in the second, the company is the center. This significantly alters the approach to the solution by altering the perceived problem and may lead to totally different solutions (e.g. aggressive marketing as opposed to health-related informational advertisement in the given example), during step 3.

In the Ideate step, ideas are generated according to the outcomes of steps 1 and 2. Many ideation techniques can be used during this stage, varying from brainstorming to identifying the worst possible idea in order to reduce options. The goal at this stage is to approach the problem in innovative and least expected ways. It is important to collect as many ideas or possible problem solutions as possible when entering this step, in order to allow the selection of the most appropriate one after the cycle of the DT process is completed.

The 4th stage is rather obvious. A Prototype solution is built, based on the outcomes of the previous 3 steps and beta-tested, possibly within a limited number of users, in order to identify the pros and cons in order to improve it. The improved product is to be more extensively Tested in step 5. Iterations of the intermediate steps occur throughout the DT process, based on the outcomes of each step, as depicted in Figure 4. A newer variation of the d.school model introduced a 6th step, that of Sharing when referring to Education in K-12 classrooms (IDEAco, 2014).





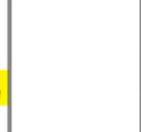



Picture								
University or institution	Stanford + University of Postdam (Hasso Plattner)	Stanford	IDEO			IDEO & Riverdale	Nicole Arnett Phillips	Next Gen Minipreneurs
Model	d.School models		3 I's	HCD 2009	HCD 2015	DT for Educators	Nicole Arnett Phillips	Entrepreneuria I Engine
n° phases	6	5	3	3	3	5	3	5
Phases	Understand	Empathy	Inspiration	Hear	Hear	Discovery	See	Inspiration
	Observe					Interpretation		
	Poit of View	Define	Ideation	create	create	Ideation	Shape	Ideation
	Ideate	Prototype				Experimentation		Interaction
	Test					Implementation		Deliver
Complementary toolkit	No	yes	No	yes	yes	yes	No	yes

Figure 4: Stages of various Design Thinking models compared (D-Think, 2015).

As already mentioned, several DT models can be found in the literature. Most of them incorporate 3 to 5 steps (Figure 4). Being simplistic, the DT process comprises in the following core tasks: a) Conceptualize and understand a situation or an issue, b) Define the problem by studying various aspects of it, c) Generate ideas, d) Implement solutions, and e) Test the solutions. Further examining Figure 5, some interesting interpretations can be made, especially when focusing on educational settings. The Empathy step in some cases is defined as "Understand-Observe", "Discover-Interpret" or "Inspiration". Regardless of the terminology and based on the previous description of this step, it is all about examining multiple points of view of something (problem, situation, issue, etc.) in order to gain alternative perspectives and fully understand it. This leads to the selection of the appropriate point of view which guides the designer to the proper formulation of the problem (Step 2 - Define). In the more recent version of the d.school model, this step is described as "Point of View", further elaborating that during this stage the point of view mainly serves the rest of the process. In many models, the "Define-Ideate-Prototype" steps are combined in one, namely "Ideation", "Create" or "Shape". This could be because most of the iterations occur between these steps (especially "Ideation" and "Prototype") and mainly the design thinkers move from the definition of a problem to the testing of a selected solution. Probably the term "Experimentation" in the IDEO model better describes this step, especially in group settings.

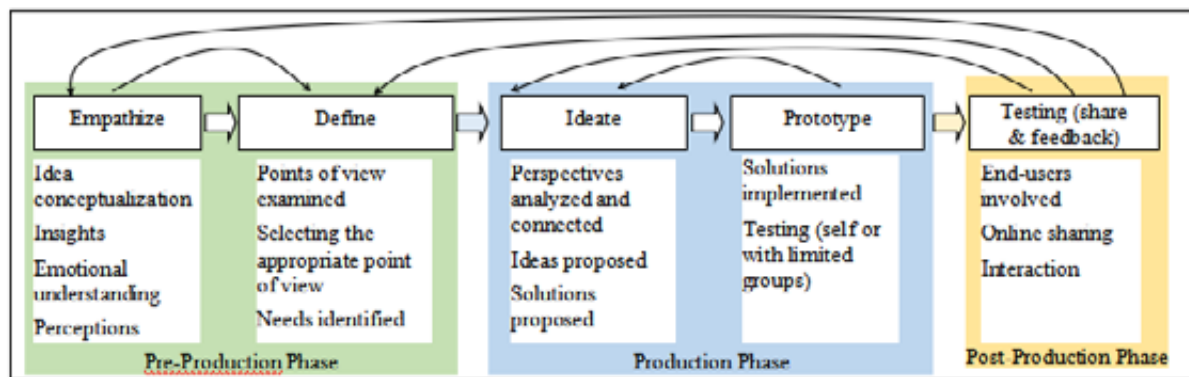


Figure 5: Phases and tasks of the design thinking process based on solution production.

Overall, taking into account the division of the DS process in production-related phases (Figure 2), a similar approach could be followed for DT (Figure 5). The pre-Production phase is about conceptualizing and perceiving in order to fully understand the problem and the consequent issues/aspects to be addressed. The Production phase involves coming up with ideas and testing them (prototype versions) and the post-Production phase involves end-users for a more extensive evaluation of the reached solution. The arrow-depicted iterations follow the ones in Figure 3.

Focusing on Education, DT was initially part of related domains and taught implicitly, but later on it was explicitly taught in general as well as professional education, across all sectors of education. As a subject it was introduced into the secondary level in the UK in the 1970s, gradually replacing and/or developing from some of the traditional art and craft subjects, and increasingly linked with technology studies (Archer et al., 1979; Owen-Jackson, 2000). Lately, research on how to incorporate DT in general education has increased and especially in the K-12 level, it is used to promote creative thinking, teamwork, and student-centred learning. A milestone in the related research was the course introduced by the Hasso Plattner Institute of Design of Stanford University in 2003 known as the d.school, as already mentioned earlier in this section.

4. DIGITAL STORYTELLING AS A DESIGN THINKING PROCESS

In the previous sections, the DS and DT cycles were presented in detail, attempting to examine them in a juxtaposed manner, based on three phases of producing an artifact (a digital story or a product, accordingly). Both processes are of a creative and innovative nature and can be applied in group settings, especially in education, when students act as creators.

The relation of these two approaches with education is further discussed in the next section. At this point, a correlation among them will be attempted in order to identify similarities and elements of convergence. For this reason, a common aspect should be identified, serving as a conjunction point. The very nature of the two processes can clearly address this issue, since through them an artifact is eventually constructed; in the case of DT it can be any kind of product or service and in the case of DS it is a digital story. Thus, examining them as processes of creating something, their similarity is evident if a story is considered as a product. In both cases the construction process is described, starting

from the initial conceptual approach and inspiration to the final sharing of the product which leads to feedback reception.

Considering that DT refers to a wider product range, DS seems more appropriate to be examined as a DT process. In the first step, both processes involve an empathic approach to something that is being conceptualized. In the case of DT, a designer needs to empathize with the end-user, the problem itself or a specific issue. This is necessary in order to gain alternative perspectives and fully understand the problem to be solved by placing oneself "into the shoes" of others in order to get inspired. As described in the previous section, this is important in order to reduce the thinking burden by omitting own assumptions. At this stage, significant amounts of information are gathered, only to be used in subsequent steps. In the case of DS, at this stage inspiration also takes place and the story is being envisioned. The storyteller decides what to tell, why, to whom and about who or what. A good story involves characters and corresponding instances/situations. Thus, at this point story elements are constructed at a preliminary level. For example, characteristics of the main character like appearance, gender, qualities (good or bad, clever or not, kind or evil, etc.) are practically decided during this stage. Questions like "where will the story take place", "what will it be about", "where and when does it take place", "why should this story be told" are to be answered. For that to happen effectively, the storyteller needs to fully empathize with the main character (or even additional characters), but also the status (social, historical, emotional, etc.) he/she might be in. In other words, the storyteller gets inspired and tries to put him/herself into the characters' shoes and gain insights which will serve the story through a specific point of view onwards. Overall, this step is about empathizing with the product and corresponding aspects which in the case of storytelling are the characters, the story elements and the overall story concept.

In the second step of the process the problem is defined and formulated by putting together all the information gathered in step 1. A specific point of view (regarding the end-user and the design approach) is selected and needs are identified. In the case of DS, elements defined in step 1 are elaborated and analyzed using various (creative writing) techniques. Furthermore, the point of view of a good story also depends on the audience's characteristics and perceptions. This leads to decisions regarding the story elements and the plot (e.g. is the main character young or not, where exactly will the story take place, etc.), further establishing the overall point of view from which the story will be told. Thus, in a way a needs analysis takes place, referring to the needs of the story and the needs of the audience in order to eventually write the actual story.

Step 3 initiates the production phase. Ideas are brought up, using various techniques, and the appropriate solution to work with is selected. This involves some elaboration on the solutions in order to examine their feasibility or worthiness. In DS, this step is about searching for and/or creating the multimedia files for the story's digital version. Based on technical (e.g. royalties, file properties) and qualitative aspects (e.g. style, mood), several files can be brought up before the final selection. This is similar to the idea proposing stage, before selecting the solution to be followed. The technical criteria application when selecting the files may correspond to the idea proposal stage (gathering up files), whereas the qualitative criteria application to the analysis and connection stage (making meaning and being coherent) of the DT process.

In stage 4, a prototype is created and tested, based on the solution selected earlier. Testing

means examining if the requirements initially identified in the pre-production phase are met. Shifting to DS, in this stage the story is transformed into a script and a storyboard is created. Actually, the latter is a full, structured description of the digital story, including all the necessary elements and information of the final digital story in detail. It is the phase of a digital story design in which all the important decisions are made, and after its completion, implementation with the selected digital tool follows, with no more setbacks. All the audiovisual effects, the audio carpets, the voice recordings, and the required elements are chosen and placed together in this stage. Common questions to be asked while constructing a storyboard are: “are all the frames necessary”, “is anything missing”, “is everything clear and ‘working’”, etc. After completing the storyboard, the technical part of the implementation is merely a task of following instructions which are included in the storyboard. Considering all these questions during this task and following the experts’ encouragement to reflect upon the storyboard and collect as much feedback as possible before the final implementation that could be considered as the prototype testing stage described in the DT process.

The final stage in both DT and DS is about sharing and collecting feedback. In the case of a product design the feedback usually is about whether the preferred solution was efficient, functional, etc. In the case of a digital story, the feedback is about whether the message was conveyed, the emotional approach was effective and overall the story “worked”. In both cases the end-users (or audience) are the ones to provide the necessary feedback to decide upon the success of each process.

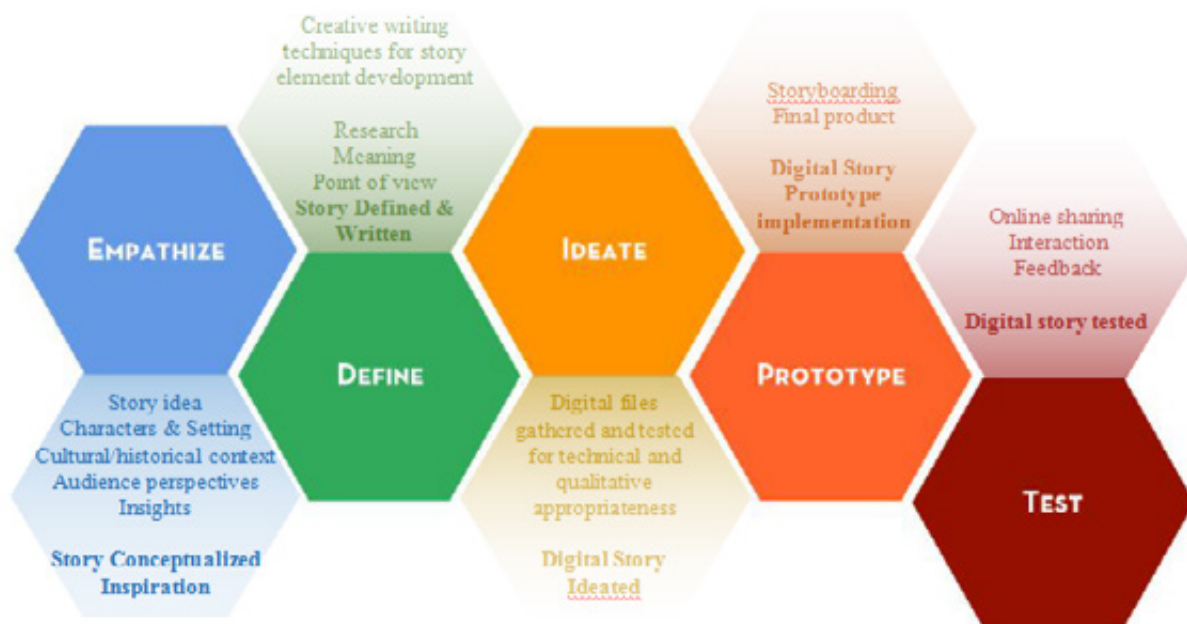


Figure 7: Digital Storytelling as a Design Thinking process.

The comparative, analytical presentation of the processes in this section demonstrated that actually they are similar, if not identical. Thus, it seems safe to claim that DS is actually a DT process, considering that the step sequence is about: a) Empathizing with a story’s conceptual elements like characters, setting and context; b) Defining the story by precisely describing its elements, including point of view and message to be conveyed; c) Ideating

the digital story by attaching appropriate audiovisual material for enhancing the written story; d) Prototyping the digital story by constructing the storyboard, a nearly-final digital product; and e) Testing the digital story by “putting it out there”. This stage correlation is graphically depicted in Figure 7.

5. DISCUSSION

Education is rapidly changing over the past few years, partially due to the development of technology and its integration in many aspects of social life. Lately, education is perceived also as the cultivation of competences in various areas, comprising in knowledge, skills and attitudes. In the Future of Learning (Redecker et al., 2010), three key concepts are highlighted that should guide learning in the future: personalisation, collaboration and informalisation, although not yet prioritized as the main focus of education. According to OECD (Instance, 2015), education has evolved from “teaching people something” to “making sure that individuals develop a reliable compass and the navigation skills to find their own way through an increasingly uncertain, volatile and ambiguous world”. Thus, schools need to prepare future citizens of a rapidly evolving world by nurturing “ways of thinking and working”, focusing on innovation, creativity, communication and collaboration, but also “social and emotional skills that help people live and work together”.

In this vein, both DT and DS as educationally appropriate approaches are gaining momentum over the past years. Both are of a creative nature and involve information processing, high order thinking, decision making, experimenting and expression, among other qualities. They can be considered as active problem solving approaches, involving students in multidisciplinary collaborative activities within which they are able to design their own learning paths. One of the main characteristics of DT is the iteration between steps which in an educational context can be planned by the teacher who creates a design disruption, thus deploying a situation which resembles a cognitive conflict. Although in the case of DS iterations are not common they can also be planned in educational settings by the teacher. There are several ways to achieve this, some of which have appeared lately in storytelling workshops. For example an additional character can appear at some point of the plot, or the main character can be presented with a new quality or ability (e.g. when using storycubes in the first place). This may lead to iterations, mainly from step 2 and onwards (Figure 2). A corresponding workshop has been designed at the University of Western Macedonia, in Greece, but data has not been analysed at the time this paper was written. Eventually, empirical evidence that this approach is beneficial for students will be available, further highlighting the similarities between DT and DS as processes.

What this paper attempted is to highlight the commonalities between DT and DS as active learning, collaborative processes. In the previous section, the step by step correlation indicated that DS can be perceived as a DT approach, when applied in education as a collaborative approach. That is when students are required to construct digital stories in groups, within an educational context. Not putting aside the literature of each topic which proposes techniques and tools for applying them in education (which was not analysed in this paper, merely a few examples were provided accordingly), the idea emerging from this paper allows a differentiated approach to learning design, as the digital story creation process can be alternatively structured, as a product design step sequence. In this case, the centre of attention is not the story as a literature-related product, but the collaborative

design process with the digital story functioning as a medium which additionally involves emotional understanding and literacy. Of course, comparative case studies need to be conducted in order to prove this claim in the future.

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