

STORYBOARDING AS TEACHING PRACTICE AND ASSESSMENT TECHNIQUE IN TEACHER TRAINING: A SURVEY STUDY

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ABSTRACT

This study investigated in-service teachers' instructional design performances in designing storyboards for Serious Games through some tools and planning procedures crafted by the team of *Erasmus+ project Ecological Learning and Simulation Environments in Higher Education* (ELSE – 2018-1-IT02-KA203-048006). The ELSE project was promoted and coordinated by Università della Tuscia (IT) for the span of the past three years and included a consortium of ten universities, among which IBU (N. Macedonia). As part of a flexible toolkit to be used by academic tutors to design and deliver lessons, one of the Intellectual Outputs envisaged the production of a digital editor (ECORE) for the creation of learning games (Serious Games) to be destined to academic teaching environments. The experience carried out during the ELSE project has inspired a related yet more specific issue connected to the pre- and in-service teacher training initiatives organized by the Tuscia partner: i.e., could storyboarding be adopted within an effective teaching practice and as a learning assessment technique in teacher training? Significant indicators and qualitative data, supporting a subsequent structured research project, were collected through an explorative survey conducted on in-service teachers engaged in a Training Course for Special Needs Teachers (SNT), in the A.Y. 2019-20. After playing a Serious Game created by the project team, this group of 40 teachers produced storyboards to simulate further typical school situations at all levels. The analysis of their products revealed a relevant educational potential for the practice of storyboarding as a teaching/learning strategy and provided practical indications in favour of the research hypothesis.

KEYWORDS

INSTRUCTIONAL DESIGN, SERIOUS GAMES, STORYBOARDING.

JEL CLASSIFICATION CODES

O21, M19, C53

1. THE ELSE EUROPEAN PROJECT: A START-UP FOR EDUCATIONAL RESEARCH IN TEACHER TRAINING

The exploratory survey reported in this article started as a spin-off to the Erasmus+ project *Eco/logical Learning and Simulation Environments in Higher Education* (ELSE, 2018-2021) promoted and coordinated by Università degli Studi della Tuscia (Viterbo, IT) in partnership with other nine universities, both within EU and beyond, as well as with Entropy Knowledge Network, an Italian small-medium enterprise (SME) specialising in Technology Enhanced Learning. The main aim of the ELSE project was to innovate academic pedagogies in view of developing students' competences for the XXI century and spread the use of virtual simulations and gamification into Higher Education.

Starting from a state-of-the-art survey of the Bologna process, at least in the countries involved, and from the identification of good practices in academic teacher training, the ELSE Consortium produced some easy to-use technological tools for academic instructors. The complexity of the design process and the teamwork required by the implementation of digital teaching tools—including figures such as the *training specialist*, the *instructional designer*, the *digital developer*, etc.—are some of the main obstacles to the diffusion of gamification in an academic environment. In order to facilitate game designing to the ELSE members, the technological partners built friendly tools and procedures. One of these digital tools named Ecore, a basic learning game editor specifically developed by EntropyKN,

gave all the participants the opportunity to test themselves in the role of designer and developer of Serious Games (SG). It allowed even the less tech-savvy teachers to design and create prototypes of learning games, structured as experience environments (such as standard or fantastic situations), within which the player must search for and choose the best solutions to the problems they are confronted with.

ECORE is aimed at training a *learning game designer's* basic ability i.e., planning training actions based on objectives and creating an engaging storytelling experience. It allows to represent a realistic or a fantastic story divided in a number of 'problematic' scenarios, in which the player, through an avatar, is engaged in opting for one of the solutions proposed by the game. Each choice made by the players can be based upon or supported by additional materials - links to further readings/videos, additional observations, thematic insights, etc. - to improve the learning experience.

ECORE is structured in a multiple-choice mode and on a win/lose model: zero points are awarded for the least appropriate option; multiple points are awarded for the 'acceptable' and 'excellent' options. At the end of the game, players receive a ranking on a 100/100 scale, that is associated to a performance profile evaluating abilities-objectives on eight levels, four for the 'loser' result and four for the 'winner' result. The performance scores are associated with performance comments.

The editor's scenarios are implemented with images, characters, texts, avatars' sentences, questions and answers, with related scores, and final judgments, and they are based on a complete storyboard, prepared at the SG design stage. In fact, implementing a learning game through the Ecore editor requires some necessary design steps. The 'instructional designer' starts from a template that clarifies the overall intended learning outcomes of the game and reflects on the most effective strategies the players could adopt to reach the final goal. The design last step is indeed the core of the game design: the storyboarding. The teacher-designer must identify a number of steps through which to achieve the selected learning outcomes, create a story narrated through a succession of frames-scenarios and associate performance comments with the final performance scores.

As a member of the ELSE Tuscia team, the author of this article designed SGs through Ecore and analyzed the processes, skills and pedagogical knowledge involved in storyboard planning for the implementation of SGs, especially in the basic form provided by the Ecore editor. While experimenting with the trainees, the author, who is an experienced pre-service and in-service teacher trainer, was struck by the observation that the knowledge, the skills and the operational logic needed to design a SG-functional storyboarding run parallel to those involved in instructional designing according to the competences learning framework, as it is highlighted in the following comparative table:

Storyboard design includes:	Instructional design in competences learning frameworks includes:
choosing the competences and the skills we want to mobilize/develop through the game, for specific end users;	crafting learning objectives for a specific group of students;
defining the general theme , the precise subject and the list of learning topics ;	choosing the disciplinary/interdisciplinary topics ;
choosing the game type (simulation game, role play game, etc.);	defining methodological approaches and strategies ;
setting up a problem-situation – real or fantastic – that is functional to the target skills;	crafting the task/problem/project that students will be working on;
developing the story that the players will be told and defining the settings , the characters and the dialogues ;	planning situated experiences and selecting digital multimodal resources to facilitate learning;
defining the challenges and the response options , adequate or dysfunctional to the solution of the problem;	developing a check list and assessment strategies ;
evaluating outcomes and producing feedback that can guide the player to a better performance.	defining outcomes evaluation criteria .

Both storyboard designing and instructional designing in competence-oriented teaching/learning require the designer-teacher to integrate content knowledge, pedagogical knowledge and design skills. In both planning models, an ‘effective’ and functional relationship among the key components (objectives, challenges, tests, assessment/evaluation criteria) mainly depends on the teacher’s ability to craft environments for experiential learning - tailored on a specific student target - which build upon the competences to mobilize and the specific goals to achieve, regardless of where the learning experience is placed: in a real or virtual environmental context. The contemporary international pedagogical frameworks highlight the key challenge for innovative teachers: designing and managing multifaceted and multimodal learning environments based on the twenty-first-century skills. However, in the digital knowledge and media age teachers and trainers are required ‘to act’ foremost as learning designers and managers. Therefore, these skills should be considered necessary and preparatory for the teacher/trainer who intends to use technologies in teaching in an effective way.

Storyboard design, as a preparatory and functional phase for the creation of ECORE SGs, necessarily includes: developing a story that will be told to the players, defining the problematic situations and challenges that the player will have to face, identifying the possible gaming functional-dysfunctional strategies, anticipating the set of response options and producing feedback that can orient the player towards a better performance.

These essential storyboarding ‘steps’ involve the teacher-designer in an architectural process that ‘develops’ progressively, in a circular and recursive way. S/he is continuously engaged in integrating gaming key components, relating challenges with strategies, and verifying the functionality of the learning environment he is crafting. Monitoring and checking the reticular connections of the project structural components are the essential activities in which a designer is engaged—already in the storyboarding phase—although the final validation of a SG implies implementing the game storyboard through an editor and playing a game-test. These are the reasons why the analysis of the storyboarding procedures and of the skills involved led the ELSE researchers from the Tuscia partner to consider storyboard design for the ECORE editor as a useful form of self-regulated learning instructional support for teachers’ professional training.

Referring to the context of the University of Viterbo, where initial and continuous training courses for teachers have been organized for years, the author of this article has planned an exploratory survey to be conducted with participants of one of the current courses to find evidence supporting the following hypothesis: *could storyboarding—as a preparatory and functional stage to the creation of Serious Games—be adopted as an effective teaching practice, and as a learning assessment technique, in teacher training?* The aim of the survey was to explore in-service teachers’ ‘storyboarding performances’ and collect qualitative data in support of a more structured research project to be developed in future.

2. SURVEY SAMPLE AND METHOD.

A Training Course for Special Needs Teachers (SNT), that took place in Viterbo in 2020, offered a useful context for an exploratory survey. In such courses, the training activities are aimed primarily at developing the operational skills needed to manage students with special educational needs. Trainers generally adopt methodologies such as *case study*, *situated problem solving*, *intervention simulation*, etc., while trainees are constantly invited to study typical situations and evaluate any scaffolding measures. The ELSE researchers considered the SNT Course-2020 as a particularly suitable context for an exploratory activity about the sustainability of their hypothesis.

An additional activity was proposed to some of the trainees at the end of the training course. Specifically, the activity involved about 40 teachers who had to retrieve a few hours of absence by carrying out additional tasks suggested by the trainers. Thus, the choice of the sample-group—40 primary and secondary school in-service teachers—was completely randomic, both in terms of the level of the learners’ competences and in terms of the school order they were teaching.

During the first phase of the survey, the teachers were invited to ‘play’ one of ELSE SGs: *A difficult start*. Researchers motivated this experience with the opportunity to include gamification among the ‘techniques’ that are functional to crafting highly inclusive learning environments. Referring to the aim of the survey, the researchers proposed the gaming activity to ‘introduce’ the participants to this type

of digital tool, specifically to ECORE learning game type. After teachers played the SG, they were asked to fill in a ‘small’ feedback questionnaire to collect some data about the trial.

• Have you played any other digital training game (serious game, role-playing games, simulation games and so on)?
• Do you think that training in a simulation environment is useful in order to develop competences and abilities to apply in the real world?
• Which abilities/competences can be developed by playing <i>A difficult start</i> ?
• Do you think you could improve your score by playing once again or more?

The game named *A Difficult Start* is an ELSE product designed as a role-playing simulation game to be used in initial and continuous teacher training. The game is a digital tool for experiential learning through *problem solving* and *roleplaying* activities. It presents its players/teachers with a typical school situation. The teacher/avatar is required to face and overcome several difficulties: a young, newly qualified teacher of Italian, who is spending her probation year in a high school, is tasked with solving a complex range of issues. For the purpose of the survey, the researchers chose a game situation/story that was relevant to the teachers sample but that did not refer to the specific themes of the SNT Course. This was meant to avoid anticipation of the second phase of the survey.

The general situation and the problems the story presents the players with are particularly critical but they are plausible and they significantly elicit some essential *soft skills* teachers should possess: *relational-communicative abilities, cooperative abilities and the ability to work in a team, conflict mediation, listening and data inference abilities in a specific context, pro-activeness in difficult situations as well as the awareness of one’s role*. The storyboard of *A difficult Start* develops through 13 multiple answer steps with three choices each, with the only exception of the two most important steps, where deviations in the plot are added so that players can make up for any previous error. The point system is as follows: zero points are awarded for the least appropriate option, whilst multiple points are awarded for the ‘acceptable’ and ‘excellent’ options. *A difficult Start* is structured on a win/lose model, however, it has been created with a view to providing a role-playing experience where the player’s behavioural profile is foregrounded so as to foster behaviour analysis at an eventual debriefing stage.

After playing the SG, the teachers-sample was asked to design a story board that could be functional to the creation of a learning game, on the model of the one just played, selecting a theme/typical situation among those analyzed during the SNT Course: “Build a story board - as per the template - to create a training game related to a course topic/case study”. All participants were given the storyboard model used to design games with the ECORE editor. During the storyboarding phase, the participants were given the chance to request and receive more scaffolding interventions from some course tutors. The researcher allowed the teachers sample-group to seek tutors’ help in order to monitor their behaviour during the task and collect additional qualitative data for research.

3. DATA ANALYSIS AND SURVEY FINDINGS

All the participating teachers had many years of teaching experience and good instructional design skills in competence-based learning/teaching, as tested during the SNT course. However, the data collected through the questionnaire show that only 4 out of 40 participants had actually had some previous experience with SGs (question 1). On the other hand, most of the sample teachers (32/40) recognised an educational value to exercising/developing one’s abilities through a digital learning game (question 2). As regards the competences mobilized by the S.G. (question 3), these were partially or completely identified by 36 players. Most respondents found the game experience an opportunity to think about their modes of behaviour and choose the most effective ones in order to transfer them to the real world (question 4).

The storyboards designed were analysed by the researcher together with the trainers and support tutors of the SNT Course to evaluate their overall consistency and ‘gameness’ functionality. The qualitative results were as follows:

12/40 teachers made storyboards with a ‘good level’ of consistency among *training goals, simulated situation, player challenges, expected performances* and *final comments/feedbacks*.

21/40 teachers produced a coherent and functional project only with a second version of their storyboard, after a scaffolding action by the tutor.

7/40 teachers produced a coherent and functional work only with a third/fourth version of their storyboard, after multiple scaffolding actions by the tutor.

Most participants needed scaffolding to design a functional storyboard; however, the 12 participants who produced good storyboards were also among those who achieved the best scores during the SNT course in general.

All the participants created effective stories staging challenging problematic situations. They showed a good content/topic knowledge although many of them failed to integrate the key components functionally. The main critical issues concerned the consistency and the logical connections between ‘learning objectives’, ‘challenges’ and ‘answer options’ crafted. Thus, we can confirm that the teachers’ performance data provide indications for planning a more extensive research on storyboarding and instructional designing. Since even experienced teachers ‘seem’ to need improving and consolidating their didactic design skills, the research team consider that ascertaining whether practical training on storyboard designing, joined to specialized scaffolding, could be an effective training practice to develop pre-service and in-service teachers’ design skills is extremely relevant. Crafting storyboards for SGs, even just the multiple-choice type, requires the designer to monitor and assess the functionality of the global architecture systematically. Such a ‘systemic approach’ to learning design could be developed and improved as a specific skill in itself. Regarding that, it seems appropriate to propose SG storyboarding as a useful self-regulated learning tool for teachers professional training. In order to obtain research evidence supporting this ‘challenge’, the outcomes of storyboarding practice have to be investigated in teachers training contexts which provide scaffolding and debriefing activities. A research planning will also have to include: a longitudinal study approach on a small sample of teachers; teacher trainers with systemic thinking/analyzing expertise; monitoring the participants educational design performances in their classroom activities; during and post training sessions in order to test if and how the teacher trainees’ design skills grow.

As can be expected, these operational indications related to methods, sample composition, settings and procedures, as they are suggested by exploratory survey findings, must be integrated into a research project oriented and supported by contemporary international pedagogical frameworks and some relevant studies in the area of teacher education and training.

Teacher’s professional training in the digital knowledge and media age “implies a new epistemology of professional knowing and action. Modern teachers are required to act as change agents” (Arvanitis, 2018) implementing some basic educational paradigms in their everyday classroom practice such as transformative education (Kalantzis and Cope, 2012), reflective teaching pedagogy (Lieberman and Miller, 2009; Joseph 2014) and educational uses of technology. This ‘desirable’ approach to learning outlines a new kind of professional teacher. The innovative teacher combines technological knowledge, pedagogical knowledge and content knowledge (TPCK framework by Mishra and Koehler, 2006) to design multifaceted and multimodal learning environments based on the twenty-first-century skills.

So, the new teacher is asked to possess good expertise in instructional designing: a “purposeful activity that results in a combination of strategies, activities, and resources to facilitate learning” (Sims and Koszella, 2008). A literature review on instructional design, completed by UPCEA eDesign Collaborative Research Team (2018) identified and defined a substantial set of skills and competencies necessary for instructional designers (IDs) actively working in education. Learning by Design (LbD) (Kalantzis and Cope, 2005; 2012; Van Haren, 2007), an epistemological framework of professional learning, has involved teachers in LbD experiences for more than 20 years, engaging them as reflective co-researchers and knowledge designers with the primary aim to improve their instructional design skills.

Also with regard to relationship between designing skills and system thinking skills, the scientific literature provides some contributions on use/design of SGs in order to train players/designers to approach complex phenomena as systems-thinkers (Gee, 2007; Games, 2008; Brown and Thomas, 2008; Ateskan and Lane 2013; Dell’Aquila 2017; Devane, Durga, and Squire 2010).

Therefore, this first explorative review of theoretical frameworks and scientific studies, confirms that a research project on the practice of storyboarding in teacher training is well-founded and significant.

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