A GUIDEBOOK TOOL FOR LEARNING SCENARIOS DESIGN IN INITIAL TEACHER EDUCATION

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Abstract

This paper describes the design process of a guidebook tool for teachers about the topic of learning scenarios design in initial teacher education. This online tool was developed under the scope of the Project Technology Enhanced Learning @ Future Teacher Education Lab (TEL@FTELab) of the Institute of Education of University of Lisbon. The guidebook (http://ftelab.ie.ulisboa.pt/tel/gbook) was organized in four dimensions: (a) planning, (b) production, (c) implementation, and (d) assessment. For each dimension the guidebook organizes many resources (e.g., texts, books, videos, articles, links) and examples of digital technologies that can be mobilized in that dimension. At the end of the project, the expectation is to have a powerful tool to support teachers who want to adopt the learning scenarios approach in their classes.

Keywords: learning scenarios, initial teacher education, technology enhanced learning, Tel@ftelab

Introduction

TEL@FTELab Project

We live in a technology- enhanced society where technologies are in almost all activities and things. The Internet of things and artificial intelligence systems are emerging strongly in society and the economy and briefly in our daily lives. Thus, a technology-enhanced school with emergent technologies and enhanced learning activities should be a priority to improve the development of 21st century skills in students.

Nowadays, it is quite clear that school and education need to change. New learning spaces, new methodologies and pedagogical approaches, new forms of interaction between teachers and students and new forms of organization need to be implemented and adopted. Accordingly, new approaches need to be implemented and tested in initial teacher education. Taking this idea, the Institute of Education of Lisbon University (IEUL) – one of the educational institutions with responsibilities for initial teacher training in Portugal – designed the TEL@FTElab Project in 2015 to be implemented in the initial teacher education Master programs. In the last two decades, IEUL has participated in several projects, both national and European, in the field of educational technologies, particularly to promote the use of technology in teachers' practice (e.g., iTEC, Living School Lab, Future Classroom Lab, Learn, Plano Tecnológico da Educação, Programação e Robótica, Internet na Escola). The TEL@FTElab Project, funded by the National Science and Technology Foundation, assumes that technology enhanced teacher education

programs may represent a relevant added value to the quality of prospective teachers' training and therefore of their teaching practices.

The project takes the idea that the future will blur the boundaries between living, learning and working and this will result in the creation of flexible multiuse spaces that can accommodate a variety of activities and serve different learning purposes. This leads to the need for rethinking educational spaces and didactic approaches, involving a wide range of stakeholders. Accordingly, the project aims to find answers to the question: How does technology enhanced learning spaces offer the opportunities to provide ways of designing initial teacher education, and to provide research-based resources for teacher education in the areas of biology, informatics, mathematics, physics and economics?

Project TEL@FTElab aims to develop knowledge that fills the need for powerful engaging strategies to deliver teacher education courses for the future. It is organized in three phases. One of them is about piloting training modules, in two consecutive cycles of implementation, within the Master Programs on Teaching. Each cycle of piloting includes the co-design of learning scenarios by teacher educators and student teachers and its experimentation in real secondary school classes of biology, informatics, mathematics, physics and economics. The initial teacher education program at IEUL follows a set of principles that include the requirement of solid knowledge (a) of the subject to be taught (e.g., biology content), (b) of education and (c) of specific didactics (e.g., of biology teaching). The introduction to professional practice within the two years Master Program is carried throughout its four semesters, offering direct contact with the students within the school system and the opportunity to observe, reflect and intervene in real school situations. The student teacher's competence is shown through the teaching practice on a specific content unit in a secondary school class under the supervision of a teacher of IEUL and a local in-service teacher from that school. In cooperation with the local teacher, the student chooses a teaching unit and implements it in a class. A written report of the implementation of the teaching unit by the student is produced and evaluated by a scientific committee. Project TEL@FTELab aims to understand the impact of the immersion of student teachers in preparing and implementing learning activities at technology enhanced spaces in their professional development. This is accomplished through the design and implementation of learning scenarios.

Learning Scenarios Design: Principles, Characteristics and Structural Elements

Design scenarios have been used in many areas (e.g., marketing, software development, medicine, games design, economy and many others) as a way to think about the future, anticipating problems and predicting solutions to those problems. The use of scenarios in education can promote the development of competences required for 21st century citizens related to problem solving, communication, collaboration, critical thinking and creativity. The TEL@FTELab project adopts the idea of learning scenarios as key to planning teaching activities in technology enhanced learning spaces. Matos (2010)

defines the learning scenario concept as "a hypothetical situation of teaching-learning (purely imagined or with real substrate, widely changeable) composed of a set of elements that (i) describes the context in which learning takes place, and (ii) the environment in which learning happens" (p.3). Wollenberg, Edmunds and Bucke (2000) define learning scenarios as

> … stories of what might be. Unlike projections, scenarios do not necessarily portray what we expect the future to actually look like. Instead scenarios aim to stimulate creative ways of thinking that help people break out of established ways of looking at situations and planning their action (p.66).

According to Tetchueng, Garlatti and Laube (2008) scenarios are a powerful tool to plan and "describe the learning activities to acquire knowledge domain and know-how to solve a particular problem" (p.71). Along the same lines, Misfeldt (2015) defines scenario based education as a "newly developed framework or approach to understanding educational situations building on scenarios, understood as real or artificial situations that are used to create context, experience of relevance and immersion, in educational situations" (p. 3).

Clark (2009) defines scenario-based learning as an instructional environment in which participants solve carefully constructed, authentic job tasks or problems. For example, Carroll (2000) pointed out five reasons to adopt a scenario-based design in the design of new technological applications: (1) scenarios evoke reflection, (2) scenarios are at once concrete and flexible, (3) scenarios afford multiple views of an interaction, (4) scenarios can also be abstracted and categorized, and (5) scenarios promote work-oriented communication. Based in those reasons Matos (2010) pointed to a set of structuring elements of a scenario: (a) the organizational environment design, (b) roles and actors, (c) plot line, strategies, actions and activities, and (d) reflection and regulation.

The design and implementation of a learning scenario is conditioned by numerous factors: subject area, knowledge domain, roles played by the different agents (students and teachers) and sequences of learning activities. Matos (2014) defines a set of six guiding principles for learning scenarios design. These principles are represented in Figure 1.

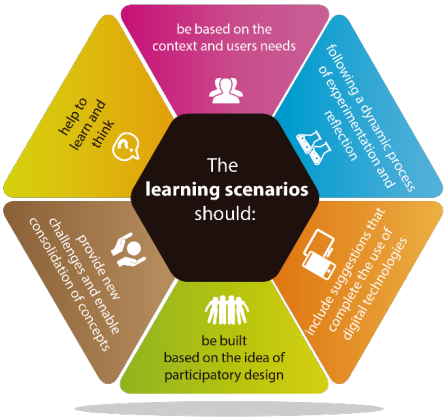

Figure 1. Guiding principles of learning scenarios design (Matos, 2014).

A learning scenario must assume a set of characteristics (Matos, 2010):

- **Innovation** – A scenario should demonstrate possible innovative activities and not provide prescriptive plans to teachers.
- **Transformation** – A scenario should encourage teachers to experiment with changes in their pedagogical practices of teaching and assessment methods and to bring about transformative educational experiences with success.
- **Foresight** – A scenario should be considered as a planning tool used to think on innovative ways of looking ahead and making appropriate decisions regarding uncertain conditions.
- **Imagination** – A scenario should always be a source of inspiration and nurturing the creativity of the teacher.
- **Adaptability** – A scenario should not be presented in a rigid way. It is up to the teachers to adapt it to their objectives and the characteristics of their students.
- **Flexibility** – A scenario should provide options targeting different learning styles and individual teaching styles. Teachers can use it at an elementary level or make it more complex.
- **Amplitude** – A scenario must be constructed to have a greater or lesser extent. The actors' role may be confined only to the level of operations and actions or intended to be active participants in the entire activity system. Scenarios may include multidisciplinary projects to be worked on by students over extended periods of time.
- **Collaboration**– A scenario may contain elements to the accomplishment of collaborative activities (synchronous and asynchronous), including technological tools that facilitate sharing and collaborative construction of objects.

Learning scenarios in the TEL@FTELab project are structured through trajectories using interactive tools mostly based on mobile technology. Those trajectories are constituted by activity proposals to explore, in a stimulating and challenging form, key ideas in teaching of the disciplinary areas of piloting (e.g., biology, mathematic, informatic, physic and economic).

Description of *Learning Scenarios Guidebook*

The *Learning Scenarios Guidebook* is an online tool to support the learning scenarios design and is organized in four dimensions based on the design and implementation process. A brief description of the guidebook's objectives, the concept of learning scenarios, and a set of resources about their design are presented. In a specific menu a set of examples of leaning scenarios developed in various subject areas are available for download. There are also two video case examples developed in the first cycle of piloting (http://ftelab.ie.ulisboa.pt/tel/gbook/cenarios-de-aprendizagem/). A video case example consists of a learning scenario description and presentation (in video animation), a set of metadata (e.g., school, students, topic, subject, student teacher and supervisor), a full and short version of scenario for download and a set of participants' testimonials (see Figure 2).

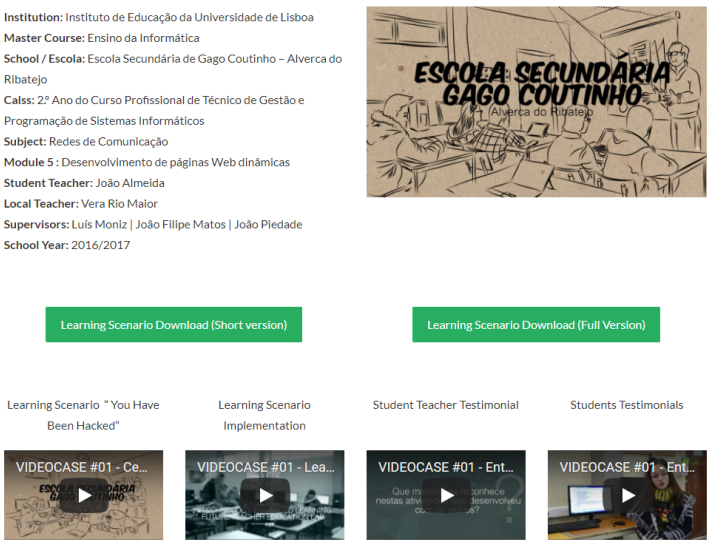

Figure 2. Video case example of Learning Scenario "You Have Been Hacked."

The learning scenario design process should be organized in the phases shown of Figure 3. The guidebook tool was organized according to those phases.

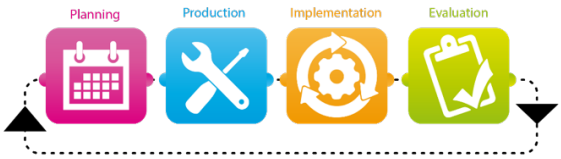

Figure 3. Phases of learning scenarios cycle.

Planning Phase

The design of a *learning scenario* is an activity that should include the reflection by the teacher or the team of teachers involved in the process. Typically, the process of learning scenario design or adaptation to a specific class of students involves the clear identification of the idea, the subject to be addressed or the problem to be solved. It is necessary to clarify the specific domain of knowledge, not necessarily linked to a single subject, and to identify the goals (e.g., learning objectives), contexts, curricular links and the requirements' analysis to the activities' implementation. Taking into account the specificities of this phase, a set of digital resources and applications is organized to support the planning activities. There is a wide range of applications and digital tools that can be mobilized in each of the various stages of the process. For example, collaborative and brainstorming tools (e.g., Paddlet, Stormboard, Glogster), mind maps creation (e.g., Popplet, Mindtools, Mindmeister), presentation apps (e.g., Prezi, Emaze, Sway), and many others.

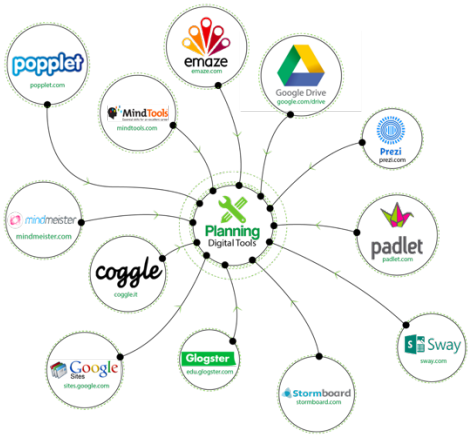

Figure 4. Example of digital technologies that can be used in the planning process.

Production Phase

In the learning scenario's production phase the teacher organizes the main ideas outlined in the planning phase in a specific template. Thus, considering the principles previously mentioned for learning scenario design, as well as their structuring elements, the teacher defines the narrative, learning objectives, methodologies and learning strategies, activities proposals, resources, actors and roles and the forms of learning regulation and self-regulation.

After the scenario design, the teacher can proceed to its licensing by using the creative commons rules defining the conditions for possible use in other educational contexts. The online guidebook provides a set of templates and resources to support the design of a learning scenario.

Implementation Phase

After the scenario design and production, the next phase is its implementation in a real class. Together with the students the teacher orchestrates a set of learning activities and develops a set of learning products outlined in the scenario, using active methodologies and strategies supported by digital technologies.

To support the design of those technology enhanced activities and to help implementation in the classroom, the guidebook offers a set of resources about some active learning strategies: (a) project-based learning, (b) problem-based learning, (c) inquiry-based learning, (d) flipped classroom, (e) gamification, and (f) pair programming (see Figure 5). These resources include an explanation about each strategy, its main characteristics, ways of implementing it, potentialities and constrains and forms of assessment and self-assessment.

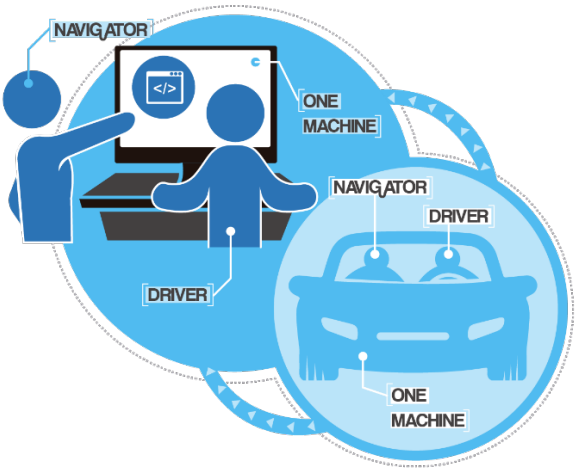

Figure 5. Example of pair programming based activity organization.

Evaluation Phase

The evaluation purpose corresponds to a careful analysis of the actual learning achieved in relation to the planned learning. It will inform teachers and students about the objectives reached and those where difficulties have arisen. The evaluation is an essential process to support the decision-making of the teaching and learning process contributing to effective learning and, consequently, to better results.

In the learning scenarios' implementation, assessment mechanisms and feedback should be present, throughout the process, contributing to critical reflection and self-regulation of learning. In the process different purposes of evaluation should be considered: diagnostic, formative and summative. According to the purpose of evaluation, some digital applications can be mobilized to support and achieve the assessment, results and feedback. Therefore, as for the previous phases the guidebook suggests a set of digital tools that can be used in evaluation and self-evaluation activities. Figure 6 shows some of those digital tools.

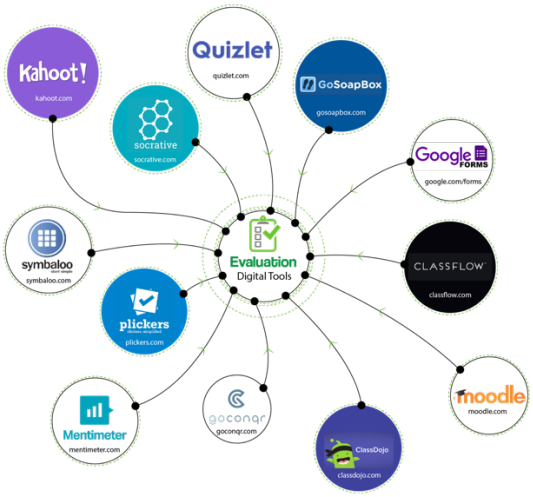

Figure 6. Example of digital technologies that can be used in the evaluation phase.

Implementation Plan and Expected Results

The TEL@FTELab project has two cycles of learning scenarios design and implementation. The first cycle was implemented in the 2016-2017 academic year and the second cycle in the 2017-2018 academic year. This online tool was designed to be used by student teachers in the second cycle during the 2017-2018 academic year. At this moment student teachers are using the guidebook to support the design and implementation of their learning scenarios in secondary schools. In the first semester (from September to January) of the scholar year, student teachers of biology, informatics, mathematics, physics and economics areas designed the learning scenarios to be implemented with a classes of students in secondary schools in the second semester. During the second semester (from February to June) the student teachers will implement the learning scenario in their class in 5 or more lessons. After the implementation process, a written report of the implementation of the teaching-learning scenario by each student teacher is produced and evaluated by a scientific committee.

At the end of this cycle, a set of video cases about each learning scenario implementation will be produced to report the process.

For the production of these video cases, interviews will be carried out with the student teacher, the class students and the supervisors, as well as the analysis of the reports and products developed by the student teacher. One of the dimensions under analysis is the guidebook tool utilization, and it is expected to produce knowledge about the impact of this online tool in the support of the work of student teachers in learning scenarios design and implementation.

Final Remarks

This paper presented the guidebook developed to support the design and implementation of learning scenarios enriched with digital technologies in initial teacher education. An online tool was organized in four dimensions and a set of digital resources made available according the specificities of each dimension.

In the current academic year, the students of the initial teacher education courses are using the tool to support the development of learning scenarios (e.g., informatics, biology, mathematics and economics contents) to be implemented in a secondary school under the scope of a course of introduction to professional practice. At the end of each learning scenario implementation, a video case is produced for dissemination; it includes a detailed description of the learning scenario as well as testimonials of the supervisor, of the in-service teacher and, when appropriate, of the pupils involved.

This guidebook is in continuous improvement process considering the inputs of the implementation cycles and analysis. It is expected that by the end of the project in 2019 a powerful tool will be available to support teachers who are willing to adopt the learning scenarios approach in their classes or educational contexts.

Acknowledgements

This article was prepared within Project Technology Enhanced Learning @ Future Teacher Education Lab funded by Fundação para a Ciência e Tecnologia I.P. under contract PTDC/MHC-CED/0588/2014

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