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de Vries, Pieter; Moropoulou, Antonia

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	Organization	Delft University of Technology
	Address	2628 BX, Delft, Netherlands
	Email	pieter.devries@tudelft.nl
Author	Family Name	Moropoulou
	Particle	
	Given Name	Antonia
	Prefix	
	Suffix	
	Role	
	Division	
	Organization	National Technical University of Athens
	Address	15780, Athens, Greece
	Email	
Abstract	Cultural heritage preservation has developed from an insular vocation into a field of innovative scientific methodologies characterized by a holistic approach combining a range of scientific fields. Unfortunately, preservation education has not been able to keep pace with all these developments. In this paper authentic learning is analyzed as a possible educational scenario to help improve preservation education to connect to the state of affairs at the preservation workplace. The purpose is to sketch an educational framework based on knowledge and experiences with authentic learning in other engineering fields as a primer for the design and implementation of 'authentic learning for preservation'. From the analysis it becomes clear that authentic learning can support the selection of valuable unknown experiences and support the design and development of 'authentic learning for preservation' experiments to help closing the gap between preservation education and cultural heritage practice. The authentic learning model as presented here clearly supplies a framework to consider in this endeavor. As such the paper can be helpful in the discussion about the usefulness and feasibility of this approach.	
Keywords (separated by '-')	Preservation education - Authentic learning - Learning technologies	



Authentic Learning to Better Prepare for Preservation Work

Pieter de Vries¹(✉) and Antonia Moropoulou²

¹ Delft University of Technology, 2628 BX Delft, Netherlands
pieter.devries@tudelft.nl

² National Technical University of Athens, 15780 Athens, Greece

Abstract. Cultural heritage preservation has developed from an insular vocation into a field of innovative scientific methodologies characterized by a holistic approach combining a range of scientific fields. Unfortunately, preservation education has not been able to keep pace with all these developments. In this paper authentic learning is analyzed as a possible educational scenario to help improve preservation education to connect to the state of affairs at the preservation workplace. The purpose is to sketch an educational framework based on knowledge and experiences with authentic learning in other engineering fields as a primer for the design and implementation of ‘authentic learning for preservation’. From the analysis it becomes clear that authentic learning can support the selection of valuable unknown experiences and support the design and development of ‘authentic learning for preservation’ experiments to help closing the gap between preservation education and cultural heritage practice. The authentic learning model as presented here clearly supplies a framework to consider in this endeavor. As such the paper can be helpful in the discussion about the usefulness and feasibility of this approach.

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Keywords: Preservation education · Authentic learning · Learning technologies

1 Introduction

Cultural heritage preservation has developed from an insular vocation into a field of innovative scientific methodologies characterized by a holistic approach combining a range of scientific fields. Students are prepared to handle several fields, but to cope with the number and heterogeneity of the different sciences involved in the preservation profession, other skills are needed to adequately deal with the daily reality of preservation work. This paper is about the development of an authentic learning approach that supports the use and appreciation of other and new skills in the context of a higher education institution. Good engineering education relies on: motivation, real life learning and the ability to communicate and collaborate, which demands students to be self-developers in a continuous improvement process [1]. An ‘authentic setting’ provides opportunities to respond in an adequate way on the demand of continuously changing requirements.

Authentic learning is an instructional approach that allows students to explore, discuss, and meaningfully construct concepts and relationships in contexts that involve real-world problems and projects that are relevant to the learner. It is making use of multiple educational and instructional techniques focusing on connecting the curriculum with real-world issues, problems, and applications. The basic idea is that students are more motivated in what they are learning when it is about new concepts and skills, and this exposure to a real-life context prepares them with practical and useful skills, and with topics that are relevant and applicable in their prospective working environment. The emergence of the internet and other new tools for communication, visualization, and simulation, have lowered the threshold for organizing and experiencing a more authentic learning environment. So, authentic learning allows for blending different kinds of learning and to give students opportunities to think and act like professionals but in a learning or training context. In a physical sense it is easy to organize, but in a pedagogical sense it needs a clever design to deal with the tasks and the limitations imposed by the curriculum and institutional constraints [2].

This paper describes the essence of an authentic learning approach in relation to the developments in cultural heritage preservation. The purpose is to sketch an educational framework based on knowledge and experiences with authentic learning in other engineering fields as a primer for the design and implementation of ‘authentic learning for preservation’.

2 Research Context

2.1 The Bigger Picture

One of the issues high on the agenda in Europe has been skill shortages in the engineering field. Looking at the progress made it seems an issue that requires permanent attention as it is firmly related to the ongoing changes in society. In general shortages emerge where the skills required are unavailable in the workforce and the opportunities for change insufficient. It might be that people are over- or under skilled, whatever their qualification level, but apparently their skills do not match the job [3]. One of the actions taken to deal with the mismatch is to forge stronger links between institutions and industry with structured partnerships as ‘knowledge alliances’ to adapt curriculum to demands of society. This notion intertwines with the perception that good engineering education relies on real life learning and the ability to communicate and collaborate, which requires that students are capable of self-directed learning in a continuous improvement process [1]. Operating in an Authentic learning environment can help to enlarge the understanding of innovation and entrepreneurship in real life and can function as a catalyzer for the incorporation of authentic learning in the field of preservation education.

Against the backdrop of the skills agenda, the skills shortage issue is clearly high on the agenda of the cultural heritage sector. The European Year for Cultural Heritage 2018 initiative called ‘Skills for Heritage: enhancing education and training for the traditional and new professions’ [4]. During this year the European institutions also focus on the ‘support of the development of specialized skills and improve knowledge management

and knowledge transfer in the cultural heritage sector, considering the implications of the digital shift'. Europe is renowned for its exceptional skills in the field of heritage preservation and conservation, but not well prepared to improve the transmission of heritage knowledge and skills to the younger generations. There is a lack of high-level professionals in "traditional" heritage occupations and therefore it is important to explore possible responses. Not only is the cycle of professional preparation often very long, also the 21st century innovation and digitalization require an appropriated response as to make better use of new technologies for heritage preservation [5].

2.2 The Focus of This Paper

The focus is on exploring authentic learning as an educational format that could lower the threshold between formal preservation education and the workplace. It is believed that improving the relationship will bring real-world problems and project within reach, bringing new concepts and skills in a format that can be dealt with in a school environment. It is an instructional approach that supports the opportunities for students to acquire knowledge, skills and attitudes directly related to a workplace setting. This paper should clarify the authentic learning concept, while using a related case study as an example of how this format can be applied in daily practice within an engineering context and deduce lessons for HEE. In this way the paper should show to be helpful to fuel the discussion about the usefulness and feasibility of this approach.

The next section is about positioning authentic learning in the broader field of learning for innovation. Innovation is very much tied to technological development and as such any change in education should have to be considered with the digital transformation in mind. In Sect. 3 the origins of authentic learning will be described including the basic structure of the way this concept has been applied in the case study. Section 4 is about the experiences with in addition a final section reflecting on the outcomes and results and the potential possibilities and relevance authentic learning might have for preservation education.

3 Authentic Learning

Authentic learning is an umbrella term for pedagogical strategies with the purpose to connect learners to environments where they gain practical knowledge and experience and lifelong learning skills including metacognitive reflection and self-awareness as being essential [6]. Strategies include vocational training, apprenticeships and scientific inquiries [7]. An increasing number of institutions have started to connect to the world outside campus, but the real-world problems and work situations do not yet have the urgency they deserve in relation to the skills issues we face.

Most teaching and learning are taking place in class rooms, laboratories, libraries and the study at home. Learning though becomes increasingly virtual through the use of ICT and such activities as job-shadowing, project-based learning, apprenticeships, Erasmus+ programmes. These are key elements of authentic learning. One such element on the micro-level is 'Learning by doing'. In this paper we focus on this 'practical' approach in relation to preservation education. The connect is to focus on the position of the student and to see what authentic learning could add and requires.

The argument is that students often come to the workplace where their competences may not always match with the demands. Demands change rapidly as a result of innovation, and the demands vary across Europe given the heterogeneity of industry, HEE and development policies. Furthermore, students often are not well-prepared to deal with the demands of innovation in organisations. It is of paramount importance that students are better prepared and have a firm understanding of practice when they leave their schools. An authentic learning environment that mimics real life in the workplace is an effective way to improve the student's capability to cope with learning demands at the workplace. Therefor the connect between the school and the future work environment needs to improve to also stay informed about changes that may take place at a rate and in ways schools are not able to cope with given their current institutional organization.

Exposure to a real-life context with topics that are relevant and applicable in their prospective working environment prepares students not only with practical and useful knowledge and skills, but has a beneficial effect on motivation [5]. Herrington and Oliver [8] state that authentic learning environments enable students to feel involved in a project as part of a larger whole with tasks that could never be carried out individually and with a stimulus for (higher) thinking processes through communication and discussion. The emergence of the internet and other new tools for communication, visualization, and simulation have lowered the threshold to develop and use authentic learning environments. As a matter of fact, ICT-use has grown immensely in the day-today practice of preservation work, but has not yet affected the approaches to teaching and learning in Cultural Heritage Education enough [4, 9].

3.1 The Theory

The origins of authentic learning draw largely on the theoretical constructs of situated learning and cognitive apprenticeships. One of the findings was that meaningful learning will only take place if embedded in the social and physical context within which it will be used [10]. Therefor one of the questions was how can situated learning be operationalized or in other words, what are the critical characteristics of a situated learning environment in higher education. According to Herrington [11] the following framework summarises the characteristics for the design of such a learning environment:

Authentic learning characteristics

1. An authentic context that reflects the way the knowledge will be used in real life
2. Authentic activities
3. Access to expert performances and the modelling of processes
4. Multiple roles and perspectives
5. Collaborative construction of knowledge
6. Reflection
7. Articulation
8. Coaching and scaffolding
9. Authentic assessment

These critical elements have been used to design and evaluate learning environments. In addition, authentic tasks have been developed as an integral component of an authentic learning environment [2]. These tasks were derived from paper reviews and were used to select cases for investigation. In the case descriptions that follow, these tasks have been used for the design of the course and the evaluation.

Authentic learning tasks

1. Authentic tasks have real-world relevance
2. Authentic tasks are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity
3. Authentic tasks comprise complex tasks to be investigated by students over a sustained period of time
4. Authentic tasks provide the opportunity for students to examine the task from different perspectives, using a variety of resources
5. Authentic tasks provide the opportunity to collaborate:
6. Authentic tasks provide the opportunity to reflect: Activities
7. Authentic tasks can be integrated and applied across different subject areas and lead beyond domain-specific outcomes
8. Authentic tasks are seamlessly integrated with assessment
9. Authentic tasks create polished products valuable in their own right rather than as preparation for something else
10. Authentic tasks allow competing solutions and diversity of outcome.

Further research explored the conditions and factors that contributed to the successful use of the tasks. The most successful applications were customer-oriented and could be considered using education more as a process than a product. The applications did not necessarily provide real experiences, but provide ‘cognitive realism’. Student support was accepted as a need to get accustomed to a totally different way of learning and to convince the students that this approach in the end would be fruitful.

4 Authentic Learning Case Description

For the case description we selected an engineering course from the Faculty of Technology, Policy and Management at the Delft University of Technology. This course ‘E-learning in Corporations’ was designed using the authentic task framework next to design principles derived from the theories of constructivism and connectivism [12–15]. It was an elective course on the use of e-learning in corporations for bachelor and master students with mainly an ICT background. The course has been operational during three consecutive years and a more detailed description can be found here [2].

The objective of the course was to confront students with the day to-day reality of managing learning demands in a market organization. Students worked in small groups and could opt for the role of educational, technical or organizational e-learning consultant. The three roles were specified in a competence matrix to show the different roles and tasks in the project, so students knew they were developing different

knowledge and skills. Hence, sharing knowledge and learning experiences, presenting findings and challenges to fellow students and discussing were crucial in ensuring that everyone benefits from the knowledge gained. ICT tools played a very important role in all interactions that took place and was a strong enabler in the process.

The topic of the course depended on the questions and demands from the company. In one case this was about ‘E-learning for On-boarding Programs’ and comprised a comparative analysis to create a benchmark for this company ‘X’, which is an international marketing organization. Company ‘X’ has been transformed from a decentralized organization into a more centralized organization and decided to implement an On-boarding Program for newly hired employees. The main objective of the student project was to shorten the induction period of new hires and bring employees together to collaboratively share knowledge.

4.1 The Course Cycle

The course cycle gives a concise overview of the course and the learning activities taking place. The course cycle of E-Learning in Corporations consisted of five steps and is graphically represented in Fig. 1. Step 1 and 2 are about the exploration of the subject e-learning. Students work on individual assignments and the outcomes were discussed in the group. Next was the devise of learning goals. Students formulate their individual learning goals in addition to the generic ones. Students work in small groups, have different roles and gain different knowledge and skills. Sharing knowledge and learning experiences, presenting findings and challenges play a very important role.

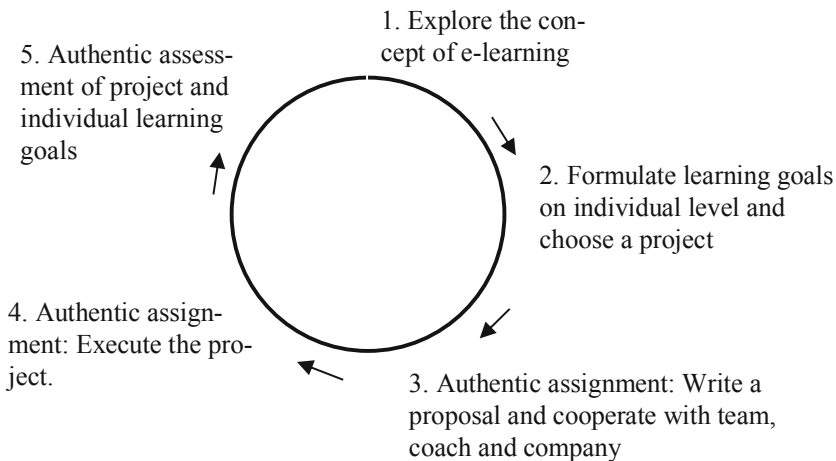


Fig. 1. The course cycle of e-learning in corporations

Step 3 is about writing a proposal. The students develop a proposal on the basis of available information and interviews and make an analysis of the company's learning demand. Issues that play a role in this process are: asking the right questions, interpretation of the data, understanding and meeting customer expectations, effective information exchange, and so on. The final outcome of this phase is a proposal containing the business problem, desired results, related activities, the planning of these activities, the division of tasks and responsibilities and a financial overview. This offer needs to be approved by the company. The core of working from an authentic learning perspective is the endorsement of learning in a natural way where motivation and initiative matter [2]. The students use a variety of different tools during the planning and executing of the project.

The final step in this cycle is Authentic assessment. Continuous review of what is going on is an important element of the authentic learning environment. Such a review focuses on how the group operates, but also on the perception students have of their own performance. Reflection on cooperation within the group and with the client in the different stages of the project is crucial. Therefore, it is important for the students to reflect on progress during the project. The summative evaluation is a combination of a process and a product assessment and takes into consideration the students' individual performance and their contributions to the project. The students personal learning goals and their personal perception of all the activities in the course are discussed at the end of the course using an 'after action review'. This 'after action review' is also used to assess the group performance: students need to answer questions like:

- What did we want to achieve?
- What happened?
- Why did it happen?
- How would we do it next time?

On the basis of this all, students receive an individual grade.

4.2 Results and Experiences

A new course with a non-traditional format certainly has its specific challenges. The course design and the achievements are discussed below using the format of the Course Cycle in relation to the characteristics and tasks of the authentic learning environment.

Organization

The design and preparation of the course logically took more time than usual. In addition to the pedagogical format it is the interaction with the business organization that accumulates time. Not all companies are interested in this kind of projects because of the expected time investment and there is no guarantee that there will be a useful final product. Also, not all assignments fit in the scope of the course. Most assignments were found through the use of the teacher's personal network. This requires targeted actions and a continuing effort. This also means that during the project the teacher needs to monitor the students closely, to help them identify and overcome the problems that have to do with a lack of experience. The assessment phase of the project requires a lot of attention, because many sources of information serve as input for the final assessment which is time consuming and there are always issues of validity.

Process

Most students became knowledgeable enough about e-learning to handle their position as junior consultant, but with little in-depth knowledge about the matter. This often led to a misjudgement of the real business situation, which surfaced mostly during the careful analysis of the interviews (2×30 min). Particularly when it comes to substantive advice, e.g. the selection of tools for improving internal communications, the students were confronted with a complex thinking process they are barely trained for. Because the students themselves co-determine the process. They are a key factor in this student-centred approach, but miss the experience to fully understand the consequences for the project. It is rather difficult for the students to monitor their learning objectives and act accordingly. Most miss the overview, due to the complexity of the business case. The dependence on third parties is sometimes difficult to digest, such as the repeated postponement of an appointment by a manager and thus increasing the time spent on less important issues. On the other hand, most students have experience with different types of e-learning, blended learning and problem-based education. This knowledge and experience were used to speed up the knowledge transfer of the students. A lack of knowledge was mostly quickly solved using their ICT skills to find answers and solutions, which also functioned as a degree of self-correcting power.

Content: Technology and Business Model

In general the students had good knowledge of ICT-related issues and little trouble with the e-learning technology itself. However, e-learning technology usually plays a minor role in the IT policy of a company and suggestions that transcend the existing framework were not well received. E-learning technology has its own limitations and therefore the opportunity to really make a difference is not likely. On the other hand, the boom in new technologies which are not necessarily familiar to all students makes it difficult to choose an appropriate solution. A good business model would definitely help in selecting tools, but the dominant business model of most training departments relies fully on formal training courses. This made it more difficult for students to come up with real e-learning solutions.

Just an example of the students' feedback taken from the experiences at Company X on E-learning for Onboarding:

- The assignment was very informative and instructive as well, because it taught me some aspects that have never come up doing other, non-real cases. Having several interviews and interactions with companies, structuring and preparing these, preparing an outline for research, experiencing collaboration issues with companies and within my group, the role of e-Learning within companies, and the e-learning literature were all very valuable for me.”
- “Overall I really learned a lot from this course. It gave me a good impression what it is like to be a Consultant, even though we only scratched the surface of this profession. Especially on communicating aspects, verbally as well as written, I see where I can improve my skills.”
- “I also got to see the importance of informal learning. I am a student who used to work alone a lot. I now see the link between the speed of the study process and collaborative ways of working. The pace of organization processes can also be enhanced by collaborative practices.”

5 Conclusions and Discussion

The focus in this paper was on exploring authentic learning as an educational format that could lower the threshold between formal preservation education and the workplace. Therefore the authentic learning model has been analyzed from a 'learning by doing' perspective to see if the concept would supply the theory and ingredients for the application in preservation education. So far, no concrete examples from that field have been available, so another case study was used from the engineering field to reflect on the experiences and the question of usefulness. The general answer can be that authentic learning does supply a format that could support preservation education to become more up to date. As in all other fields, ICT is a significant enabler and if properly used can contribute to innovate, channel and improve educational interventions. The most interesting element is that in combination with new educational scenarios ICT offers a range of possibilities to also better connect to the use of ICT as applied in the professional field like museums and others.

From experiences in the educational field it is also clear that ICT does not make a difference if the educational scenario is not accurately designed and planned by people who are willing and able to make effective educational use of technological tools [16]. This calls for further research in the field, in order to find interesting experiences and to design and develop pilot projects aiming at closing the gap between preservation education and cultural heritage practice. The authentic learning model as presented here clearly supplies a framework to consider in this endeavour.

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