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Innovating Learning Design in Higher Education

Implementation of authentic learning scenarios in virtual and blended learning environments
General Conclusions and Recommendations from Focus Group Discussions

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Authors: Michael Eichhorn, Julia Schmitt, Alexander Tillmann

Introduction

This document provides recommendations for the implementation of 11 authentic learning scenarios in virtual and blended learning environments in higher education teaching. The recommendations are both on an individual level and on an organizational level, i.e. they are aimed at university teachers as well as decision-makers in faculties and universities.

We define authentic learning scenarios as approaches, that activate students, and allow 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 (Donovan, Bransford, & Pellegrino, 1999; Rodríguez-Triana, 2021). The recommendations are based on the results of 13 focus groups with a total of 95 participants (63 female, 32 male) from Croatia, Finland, Germany and the UK. The participants in the focus groups were experienced teachers from higher education and student teachers. In the period July - October 2023, each focus group discussed several learning scenarios along the following three guiding questions:

1. What concrete advantages do you see in the implementation of a specific authentic learning scenario?
2. Which learning outcomes can be achieved particularly well through certain authentic learning scenarios?
3. What specific challenges should be considered when implementing the authentic learning scenarios?

The table below shows which scenarios were discussed in each country.

Table: Discussed Scenarios. In total 34 scenarios were selected in 13 Focus groups (FG) with 95 Participants (P.) in total.

	Croatia: FOI / SoM (4 FG, 37 P.)	Finland: Oulu (4 FG, 22 P.)	Germany: Goethe (2 FG, 15 P.)	UK: OU (3 FG, 21 P.)
Flipped Classroom	+, +	+, +, +	+, +	+, +
AI in education	+	+,+	+, +	+
Hybrid in large	+	+		+
Game-based		+		+
Hybrid in small	+	+		

Inquiry based	+			+
Problem-based	+, +			
Project-based	+	+		
Simulated patient (WBL)	+			+
Student engagement in LD		+		+
Virtual Reality	+		+	

In the following, the 11 authentic learning scenarios are briefly described and recommendations for the implementation of the respective scenarios are presented. Finally, the document provides some general recommendations for the implementation of innovative digital pedagogies in university teaching, which were developed in the various focus groups.

Flipped Classroom (FC)

Flipped classrooms are defined by (Divjak et al., 2022) as "a strategy that flips the traditional education setting, i.e., the information transmission component of a traditional face-to-face lecture is moved out of class time… [It] is an active, student-centered approach that is designed to increase the quality of the period within class, provides opportunities for structured, active learning, and encourages students to inquire and to interact with teachers, peers, employers and learning materials". Key ingredients for flipped classrooms are that learners using pre-class preparation (e.g., multimedia lectures, podcasts, pre-readings) through self-paced learning prior to attending class, while class time is used for student-centered and higher-order learning activities.

Recommendations

… for Teachers (Individual Level)
- Teachers should support students in flipped learning to build students' confidence and show them how to succeed in an active learning environment.
- Teachers should be transparent about their expectations of students in terms of engagement, workload and learning outcomes.

- Teachers should keep inclusion in mind in the context of the respective activities and, for example, create alternative preparation tasks or plan support for students who are unable to complete the asynchronous tasks.

... for Decision-Makers (Organizational Level)

- Decision-makers should create a learning culture within their institution (university, faculty) that supports the FC approach.
- The FC approach should be systematically introduced in the institution and be a general part of the teaching strategy.
- Teachers should be encouraged to use FC in their course modules.
- To support the planning and teaching of FC, concrete example scenarios (good practice) should be provided with course templates that can be adapted by teachers.
- Teachers should receive support in the creation of materials for FC, e.g. in the form of experts or, in future, through the use of AI (e.g. ChatGPT).

Using AI in Education

Using AI in Education can be defined as a broad field encompassing various techniques and approaches to create intelligent machines that perceive their environment and take actions. Machine learning is a subfield of AI that allows computers to learn and improve their performance on a task without being explicitly programmed using algorithms that can identify patterns and make predictions based on data. Generative AI refers to AI systems that generate new data or outputs, such as images, music, or text, rather than classify or process existing data. Typically, generative AI uses machine learning. Large language models (LLMs) are a type of machine learning model that can process and generate natural language text. LLMs are a type of generative AI because they can produce novel text outputs based on patterns and learn from large amounts of input data (Gimpel et al., 2023; Rienties et al., 2020). The potential applications of AI in education are very large: For example, AI can support the writing process of students (e.g. theses). Teachers can use AI to create individual learning materials (e.g. quizzes, assignments, tests) and as an assistance in learning design. Also automated feedback on student performance can be given with the help of AI (Holmes & Tuomi, 2022). When using AI, ethical aspects, such as the handling of personal data or the use of copyrighted materials in the training data must also be considered (Holmes et al., 2021).

Recommendations

... for Teachers (Individual Level)

- In order to use AI tools profitably in teaching, teachers should first test various AI tools extensively and reflect on what could be done with them. Only then should the AI tools be integrated into specific teaching scenarios.

- Teachers should gain more experience with AI, e.g. by collecting examples and ideas of what has already been used or discussing with other teachers how they have used AI successfully/unsuccessfully.
- Teachers should not only use AI tools as a didactic tool, but also make AI a topic of discussion in class to build AI competencies.

... for Decision-Makers (Organizational Level)

- Institutions should support teachers with didactic input on the use of AI in teaching.
- Collections of good practice examples should be made available, as well as collections of AI tools with short descriptions of how they could be used in teaching. These collections should be regularly maintained, updated and supplemented.
- Institutions should promote the use of AI as an opportunity for teachers and students to work together to understand and develop the use of AI in the classroom, particularly in building resources to develop AI competencies.

Hybrid teaching in large collaborative classrooms

Hybrid teaching in large collaborative classrooms Hybrid mode of teaching means that "students are simultaneously present in the same classroom, either physically or remotely" (Svetec et al., 2022), it means that a teacher is working with a group of students physically present in a lecture room, whilst other students are remote and join the same session using a conferencing system. It gives an opportunity to integrate students who are at health risk, on mobility. It is also cost-effective because we can teach big groups of students (e.g. introductory university courses). However, to achieve collaboration all students should have access to appropriate learning resources before and during lectures, irrespective of whether they will be joining the class in person or remotely. Additionally, formative assessment and feedback need to be implemented in both environments simultaneously which means that the teacher needs a teaching assistant.   Further, challenging aspects are that substantial equipment and support for teachers and students is required, interactions with onsite and online students simultaneously are very demanding for a teacher and it is difficult to implement in some subjects/learning outcomes. Out of face-to-face, fully online, blended and hybrid, hybrid is the most difficult to implement (Svetec et al., 2022).

Recommendations

... for Teachers (Individual Level)

- Teachers should have an assistant during lessons who is primarily concerned with the integration of online students, e.g. helps with technical problems or brings questions from the chatroom into the lesson.
- The function of the assistant can also be taken on by online tutors (students with the appropriate technical and pedagogical qualifications).

- The hybrid format should already be considered as the "norm" when planning the course and not just as an "bold-on" participation option.
- The choice of tools used by students to interact in the hybrid environment is crucial and should be carefully considered.

... for Decision-Makers (Organizational Level)

- Institutions should create opportunities for teachers to teach in pairs in hybrid scenarios.
- Institutions should provide additional personal support for teachers to ensure that the hybrid scenario can be carried out well. This could be, for example, a tech-savvy assistant to support the sessions.

Game-based learning for motivation

Game-based learning utilises games with defined learning outcomes (Shaffer, Halverson, Squire, & Gee, Citation2005). Game-based learning should be differentiated from gamified learning, which usually adds game elements to usual learning scenarios to make them more appealing, but without changing it too much (Plass et al., 2015). In contrast, game-based learning presents learners with a narrative, which connects character and actions in the game into a meaningful story (Shaffer et al., 2005; Plass et al., 2015). Game-based learning immerses learners into a game scenario, presenting them with a challenge or conflict, a certain set of rules and quantifiable outcome (Salen & Zimmerman, 2004). Other typical elements in the game-based learning are certain actions learners have to repeat throughout the game, incentive system which encourages learners to continue the game and predefined content to be learned through the game (Shaffer et al., 2005; Tekinbas & Zimmerman, 2003; Plass et al., 2015). Besides being intrinsically motivating to learners, game-based learning requires extensive resources and might be difficult to create (Plass et al., 2015).

Recommendations

... for Teachers (Individual Level)

- Teachers must ensure that their games have a clear purpose, achieve learning outcomes and allow time for students to reflect.

- For role-playing games, competitions or simulations in particular, teachers need to define the game space as separate from reality and safe in order to avoid potential conflicts and make the game successful.

- Teachers should move away from the assumption that games need to be complicated to be appealing to students.

... for Decision-Makers (Organizational Level)

- Institutions should offer teachers the opportunity to explore and try out existing games. They should support teachers in looking for educational added value in games.

Hybrid learning with small groups

Hybrid teaching and learning with small collaborative groups is an innovative educational approach where two distinct groups of students participate in a lecture or seminar simultaneously while being physically separated. It combines traditional face-to-face interactions with modern technology to create an inclusive and interactive learning environment. This setup allows for geographical flexibility, ensuring equal access to learning materials and resources for all students. The key feature lies in the educator's ability to effectively engage and communicate with both student assemblies, requiring substantial equipment and support for teachers and students. The use of interactive technologies and a teaching assistant is crucial for managing the complexities of this approach, bridging the physical gap between on-site and remote students and ensuring seamless communication and interaction.

Recommendations

... for Teachers (Individual Level)
- When planning their learning scenario, teachers should already check whether a hybrid setting actually has added pedagogical value for their course.

- The hybrid scenario requires a great deal of additional preparation, which teachers should plan for.

- The technical requirements for hybrid participation should be made transparent to students in advance. Teachers should also make students aware of any available options for leasing devices.

... for Decision-Makers (Organizational Level)
- The scenario is particularly demanding from a technical point of view. Institutions should therefore ensure above all that the technical equipment in the classroom is suitable for the implementation of hybrid learning scenarios.
- The institutions should also pay attention to the technical equipment on the students' side and provide suitable loan devices if necessary.

Inquiry Based Learning (IBL)

Inquiry-Based Learning (IBL) is an educational approach in which students learn by following scientific research strategies (e.g., formulating hypotheses, testing them with experiments, and/or observations) in order to build their knowledge (Keselman, 2003; Pedaste et al., 2012; Pedaste et al., 2015). IBL typically consists of sequential phrases designed to stimulate students to ask questions, investigate, create knowledge, discuss and reflect (Pedaste, et al., 2012). Key ingredients in IBL include active student participation and responsibility for their learning, orientation to solving meaningful problems, and discovery of knowledge that is new to the students (Edelson et al., 1999; Pedaste et al., 2015). IBL also presents several challenging aspects to teachers and students. For instance, it might be difficult to sustain students' motivation throughout the IBL, students need to have sufficient skills to manage their work and extended activities as well as sufficient previous knowledge to engage in data gathering, analysis, and interpretation (Edelson, et al., 1999). Teachers should also consider constraints of learning environments that might affect IBL e.g., restricted resources and timelines for implementation of IBL (Edelson et al., 1999).

Recommendations

... for Teachers (Individual Level)

- The IBL approach requires careful planning and preparation. Teachers should allow sufficient time for this.

- Teachers should focus on arousing students' curiosity and motivating them to continue their own research.

- The flexibility of the approach and the possible learning outcomes can be challenging for teachers, especially when it comes to giving feedback or grades. Teachers should therefore clearly communicate the expected outcomes, expectations of collaboration and assessment criteria in advance.

... for Decision-Makers (Organizational Level)

- Institutions should provide teachers with good practice examples and templates for planning a lesson or an entire course using the IBL approach.
- Institutions should generally promote a learning environment and culture that encourages questioning and student ownership. Such a culture is central to the success of the IBL approach.

Problem-Based Learning

Problem-based learning (PrBL) can be explained as a learner-centered approach that empowers students to research, integrate theory and practice, and apply knowledge and skills

to develop viable solutions to ill-structured often interdisciplinary problems that encourage inquiry, with the guidance of a tutor who conducts a thorough debriefing at the end of the learning process (Savery, 2006). Allen et al. (2011) describe PrBL as a method where 'students working in collaborative groups learn by resolving complex, realistic problems under the guidance of faculty.' The method is aimed at promoting deep understanding of content and it is argued that it has potential for developing process skills: research, negotiation and teamwork, writing, and verbal communication because most problems lead to demonstration of what was learned through some form of a report (Allen et al., 2011). Teachers' role as a tutor is to carefully select the problem (problem really must be a problem) based on learning outcomes, to facilitate students in how to approach the problem, motivate the students to search, and articulate the process of solving the problem. PrBL can be structured in two different ways: 1) starting with finding an authentic and engaging problem (complex just enough), introducing it to the class, organising students in groups, 2) online collaborative student activities using trained virtual agents to support students.

Recommendations

... for Teachers (Individual Level)

- The PBL approach is very demanding for students and should be well prepared by teachers. Teachers should allow sufficient time for planning.
- Teachers should know their students' prior knowledge (e.g. specialist knowledge, methodological skills, digital skills) in order to avoid excessive demands when working on a particular problem.
- Teachers should specifically seek cooperation with colleagues from other subject areas, as many types of problems in PBL have to be dealt with on an interdisciplinary basis.

... for Decision-Makers (Organizational Level)

- If the PBL approach is used too frequently or in different courses at the same time, this can have a negative impact on student motivation. The institution should clearly coordinate the use of PBL and its integration into the curriculum.
- Institutions should provide good practice collections for teachers. These should include well-structured problems and explanations to guide students and help teachers in the use of PBL.
- Institutions should encourage collaboration between teachers from different subject areas and disciplines, as this is often a crucial prerequisite for the success of PBL.

Project work in virtual environment

Project-based learning in a virtual environment Project-based learning (PjBL) is a student-centred pedagogical approach that has many parallels with problem-based learning (PrBL).

Like PrBL, PjBL is organised around real-world problems, requires teamwork and uses interdisciplinary and cross-disciplinary knowledge and skills as well as critical thinking and creativity. Specific for a PjBL is that learners receive specifications for a desired end product (e.g., designing web page) with the learning process emphasising adherence to correct procedures; teachers function more as instructors and coaches, offering expert guidance, feedback, and suggestions tailored to learner needs and the project context, incorporating teaching methods like modelling, scaffolding, and questioning (Savery, 2006). In a project-based approach, the "teacher" has more flexibility to offer direct instruction and various forms of learner support but must maintain a balance, enabling the learner to achieve desired outcomes while fostering self-directed learning skills (Savery, 2019). Guo et al. (2020) claim that creating products in PjBL is vital for integrating knowledge, improving professional skills, and fostering collaboration, as the final products represent a concentrated expression of developed competencies.

Recommendations

... for Teachers (Individual Level)
- The approach is more suitable for experienced students in the Master's program. It is also more suitable for small student groups. Teachers should bear this in mind when planning their scenario.
- Teachers should plan for a relatively high level of supervision during the course of the scenario, as the project should be checked regularly and students should receive continuous feedback on their work.
- Teachers should guide the project well in the initial phase (e.g. with good practice examples from other colleagues' projects).

... for Decision-Makers (Organizational Level)
- Institutions should provide examples of good practice to inspire teachers to set up a suitable project.

Simulation (e.g., medics and patient simulation)

Simulation methodology, such as the standardized simulated patient (SSP) model, replicates real-world scenarios in a controlled environment to provide learners with hands-on experiences and bridge the gap between theoretical knowledge and practical application. It actively engages students, enhances critical thinking and problem-solving skills, and challenges learners' clinical reasoning and decision-making abilities. The approach involves utilizing standardized patients (SPs) played by a teacher in a virtual environment to recreate authentic healthcare scenarios for training and assessment purposes. The interactive elements empower students to actively engage with the simulated patient, and a feedback system offers immediate guidance on students' actions and decisions. However, challenges

include creating an authentic virtual environment, transitioning teachers into the role of a simulated patient, and constructing scenarios that mirror the intricacies of actual clinical practice.

Recommendations

... for Teachers (Individual Level)

- When using simulations, teachers should focus on creating a truly realistic, authentic learning experience.

... for Decision-Makers (Organizational Level)

- Institutions should support teachers in the creation of complex simulations. This can be done in financial form, e.g. via university funding programs or through their own support departments for academic development.
- As the development of simulation-based scenarios is also time-consuming, institutions should also relieve teachers of some of the time burden, e.g. by reducing their teaching load.
- The approach can be combined well with other teaching methods (e.g. FC or AI). Institutions should therefore specifically develop collections of good practice and make them available to teachers. Institutions should also offer teacher training courses in which teachers create their own simulations and combined scenarios under guidance.

Student Engagement in Learning Design

Student engagement in Learning Design may take different forms due to varying levels of student autonomy and input. Students may contribute as partners in design by providing 'joint ownership and decision making over both the process and outcome' (Harrington et. al, 2014). Student experiences and voices may be bought into communities of practice to support the co-creation of materials and knowledge production by drawing on their prior educational experiences (Snowball & McKenna, 2017). Co-design approaches go beyond seeking and recognising student perspectives and acknowledges students 'as experts' by taking a 'bottom up design approach where student users drive the design process' (Gravett et.al, 2019). When planning this approach, it is vital to identify what level of student engagement is possible due to the scope of the project, time, budgets, and pool of student contributors available. It is equally important during the process to capture what was learnt or gained, what was changed as a result, and to clearly indicate in any output what impact that student engagement in learning design had.

Recommendations

... for Teachers (Individual Level)

- The method requires time and resources that are not always available to teachers. This must be taken into account at the planning stage.
- The teacher should know their pupils, their previous knowledge, skills and their social situation well.
- Teachers should take care to include all pupils in this method. It may be difficult to make good use of students' diverse knowledge and life experience if only a small number of students are accessible for the work.
- Teachers should establish clear structures and responsibilities for students to work with.
- During and after completion of the learning process, teachers should outline the impact students have had on the design process. This will help to increase acceptance of this approach and enable future work using this approach.

... for Decision-Makers (Organizational Level)

- As this approach is difficult to implement by one teacher alone, institutions should facilitate and encourage co-teaching to make it easier for teachers to choose this approach.
- Institutions wishing to promote the adoption of this approach should provide their teachers with examples of how to implement this method, including lesson plans on how to get students to participate.
- Institutions could offer workshops for teachers and students to raise awareness and acceptance of the approach.

Virtual reality (Augmented reality)

Virtual reality can be defined as an environment that „capitalizes upon natural aspects of human perception by extending visual information in three spatial dimensions", „may supplement this information with other stimuli and temporal changes" and „enables the user to interact with the displayed data" (Wann & Mon-Williams, 1996). Freina and Ott distinct between „non-immersive VR" and „immersive VR": Immersion is „a perception of being physically present in a non-physical world by surrounding the user of the VR system created with images, sound, or other stimuli" (Freina & Ott, 2015). The use of AR / VR elements in teaching enables learning experiences that would not be possible in reality (e.g. they take place in dangerous or distant locations). This can strongly motivate learners and enable self-directed learning. In addition, the use of VR / AR conserves resources because such simulations can be repeated as often as desired, risk-free trying out and repeatable as often as desired. Furthermore, the learning experiences are sensorimotor, affective learning while they can slip into various other roles (Makransky & Petersen, 2021).

Recommendations

... for Teachers (Individual Level)

- The preparation of VR scenarios is very time-consuming. The technology is also often technically very limited, which restricts the locations and possibilities for use. Teachers should consider both of these factors during the planning stage.

... for Decision-Makers (Organizational Level)

- VR technology is sometimes associated with high costs, e.g. for the purchase of VR glasses. Institutions should maintain appropriate equipment pools and develop rental concepts.
- Teachers usually have little experience and skills with virtual reality methods and scenarios. Institutions should develop training programmes for teachers (train-the-trainer) to familiarize teachers with VR technology and its pedagogical possibilities.

General recommendations

Some general recommendations can be derived from the results of the discussions in the focus groups. If these recommendations are taken into account, they can support teachers and institutions in establishing innovative digital pedagogies in university teaching.

Technical Infrastructure

The lack of suitable technical infrastructure for implementing digital teaching scenarios was identified as one of the biggest challenges in the focus groups.

- Institutions should provide the appropriate technical systems and devices that teachers and students need in digital learning scenarios.
- The technical infrastructure should be maintained by specially trained staff (software updates, repairs, etc.)
- There should be uncomplicated rental concepts for students.

Good Practice

The focus groups see collections of good practice examples as a central enabler for all scenarios under consideration. These good practices can either originate specifically from their own discipline or be available in abstract form, e.g. as didactic patterns or learning design templates.

- Institutions should provide suitable infrastructure for the systematic collection of good practice examples of innovative digital pedagogies
- the good practices should be searchable for teachers, filterable according to various criteria and easily adaptable by other teachers

● Teachers should make their learning designs available as templates, preferably with comments and assessments on implementation as well as findings from the evaluation of the scenario.

Digital Teaching Skills

Digital Teaching skills are a prerequisite for implementing authentic learning scenarios in online or blended environments that are conducive to learning. Teachers need these skills in order to integrate digital technologies into the classroom, e.g. to break down existing barriers to learning and enable accessibility. Secondly, to implement innovative pedagogy using digital tools and thus introduce them into the classroom.

● Teachers should continuously strive to develop their digital teaching skills, for example by attending formal and non-formal training courses, self-learning courses or exchanging ideas with colleagues and students.
● Teachers should systematically document their digital skills acquisition, e.g. with the help of skills profiles and portfolios.
● Institutions should offer suitable, preferably mandatory, qualification programs for teachers. In these programs, teachers should learn methodological skills for digital learning scenarios as well as technical ICT skills for using digital technologies. The critical evaluation of innovative pedagogy as well as the advantages and disadvantages of its implementation for the acquisition of certain learning outcomes should also be part of the training.

Learning Designs

● Teachers should systematically use learning design to plan and implement their (digital) learning scenarios. This will ensure that the authentic scenarios are constructively aligned with the intended learning outcomes.
● Institutions should support teachers in learning design by providing appropriate digital design tools and evidence-based quality criteria for good learning design.

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