Innovative Pedagogy Framework for Learning Personalisation of Learning Experience Design with AI tools

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Abstract

The application of AI and generative AI technologies (GenAI) tools in the educational sector has a substantial impact on well-established teaching practices. Teachers and lecturers continuously explore how to implement suitable pedagogy frameworks for using AI to improve learning personalisation, high-order thinking skills and learning experience design. Many educational institutions focus mainly on the academic integrity and ethical aspects of AI in the classroom. However, the use of AI to improve teaching and to ensure long-term consequences on learning, knowledge building and skills development is often underrated. The present research aims to propose and discuss a model of a pedagogy framework for using AI tools to improve learning experience design, adapting it to the learners' interests and needs. While learning personalisation can cover multiple characteristics, following this framework, teachers can better recognize and address unique students' situations without using personal data. They can then select relevant active learning approaches, invent or adapt innovative learning scenarios, add engaging and gamification elements and design hand-out materials. The proposed pedagogy framework is tested by a group of students enrolled in a pre-service teacher training program and their outcomes are discussed and evaluated.

Keywords

pedagogy framework, learning personalization, learning experience design, AI tools

1. Introduction

During the last few years, generative AI technologies (GenAI) are rapidly transforming the educational landscape. Both institutions and teachers are investigating the best way to implement GenAI tools to prepare skillful and knowledgeable professionals ready for future demands. Students worldwide are among the most active GenAI users, as identified in a recent GenAI company report [1], using AI primarily for critical cognitive tasks, responsible for the formation of high-order thinking skills from the taxonomy of Bloom [1]. Another research sums up that all of the students' strategies to use AI have pedagogical risks, the most important of which is "to outsource thinking" [2]. The traditional role of teachers is changing, challenged by broader processes of school digitalization [3]. More strikingly, a private school in the US is experimenting with setting up the overall educational process without teachers [4], replacing qualified teachers with personalized AI tutors for every student. Even efficient and effective for grades and tests, this school challenges how AI is affecting students' long-term knowledge formation, high-order thinking skills and relevant consequences on learning.

To respond to these challenges, the present research identifies a model of a pedagogy framework for applying AI tools in learning personalisation and learning experience design. Covering five main stages, the suggested framework outlines how AI can support the main elements of the learning experience design to create lasting and meaningful active learning scenarios. The paper begins with a background section, covering the main aspects of the pedagogical framework, explaining the difference between learning experience design and instructional design, and analysing the elements of learning personalisation. Then, the proposed pedagogical framework for learning experience design is described,

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presenting the settings of validation and the results from the testing round with students from a pre-service teacher training program. The discussion part evaluates the lessons learned and conclusions, proposing recommendations for implementing the pedagogy framework in real educational situations.

2. Background

A pedagogical framework represents a structured model or a systematic approach that provides principles, methods, and strategies for teaching and learning. A well-designed pedagogical approach focuses on students' engagement, critical thinking, problem-solving skills, and creativity. Pedagogical frameworks provide practical guidelines on how to apply theoretical principles in real classroom settings, including specific techniques, tools, and strategies. Many authors conclude that the evolution of pedagogical frameworks aligns with the increasing complexity of the learning environments and the potential of new technological tools [5]. Thus, they can serve as a blueprint that helps educators choose curriculum design, instructional methods, assessment strategies, and learning environments. Effective pedagogical frameworks can adapt to learners' characteristics, subject matter, learning environment, available resources, and cultural factors that influence the educational process [6]. Among the most commonly used pedagogical frameworks: (1) Bloom's Taxonomy [7], ranging learning objectives through cognitive tasks from low-order to high-order thinking skills; (2) the TPACK (Technology, Pedagogy, and Content Knowledge) framework [8] addressing how teachers can effectively integrate technology into their teaching by balancing technological knowledge with pedagogical and content expertise; (3) the UDL (Universal Design for Learning) [9], offering a general framework for creating inclusive educational experiences diverse learning needs and preferences; and (4) the GAIDE (Generative AI for Instructional Development and Education) [10] emerged recently, as a pedagogical framework facilitating teachers to create diverse, engaging, and academically sound materials, integrating GenAI into curriculum design processes.

The Learning Experience Design (LxD) [11] emerged as an integrative approach to active learning, which is often opposed to Instructional Design (ID). While Instructional design defines learning paths that are appropriate for the selected subject matter, it considers that instructional methodology, learners, and the learning context are all parts of one instructional system. On the opposite, the LxD recognizes that multiple and equally effective learning experiences can support the various needs of the learners and the learning context. Focusing on the quality of the learning experience, LxD considers teachers as designers of learning activities that align with students' personal motivations, goals, and values and guide them to construct meaningful understanding [12]. The LxD considers the learner as an active participant with his own needs, contexts, and preferences. To achieve a meaningful, engaging, and satisfying experience, teachers can find or create engaging learning scenarios, arrange various learning activities, and select suitable learning materials, games and digital technologies [12]. This makes LxD a holistic, learner-oriented approach that integrates pedagogy, psychology, and user experience to manage engaging learning journeys. Experiential learning emphasizes hands-on experiences, social interaction and knowledge construction through technology. LxD employs methodologies such as Design Thinking, Agile, UX Design Frameworks, Personas, Journey Mapping, Empathy mapping, storytelling, prototyping, interaction design, and UX research. The evaluation methods count on qualitative measures such as learner satisfaction, level of engagement, and models of usability.

Personalized learning [13] (PL) aims to achieve this goal by tailoring instruction, pace, methods, and content to the interests, needs, and goals of individual learners. Learners individual profiles can combine multiple characteristics and elements [14]. Breakthroughs in technology and artificial intelligence (AI) have led to a rapid increase in the applications of PL as AI-driven adaptive learning systems provide learners with individualized lesson sequences, content recommendations, tasks, and automated assessments [15]. A prevailing view in the application of AI to Education (AIEd) literature is that personalized adaptive learning systems increase access to high-quality education and are contrasted with a "traditional," one-size-fits-all approach [15].

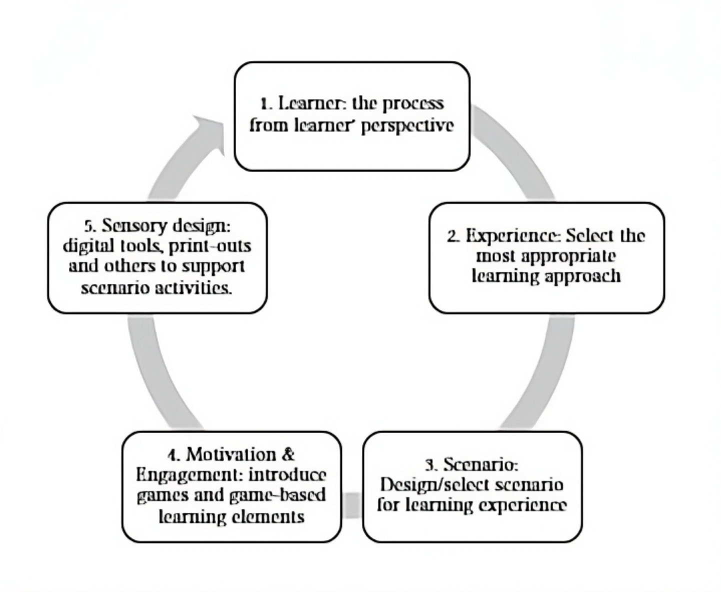

Figure 1: Pedagogical Framework for Learning Experience Design.

3. Pedagogical Framework for Learning Experience Design

The pedagogical framework for LxD (fig 1) defines the main stages of an effective learning process, focusing on practical directions and advice for teachers on how to design fulfilling educational experiences. This framework shifts the focus from "education as an output" to "education as a process". The LxD pedagogical framework covers five main phases, including knowledge acquisition, social interactions, and digital technologies within an emotionally enriching educational experience. GenAI technologies can facilitate teachers on each of these five stages, providing strategies for learning personalization and adaptation.

3.1. Learner: the educational process from the learner' perspective

The LxD pedagogical framework begins with the learner perspective. To design more efficient and engaging educational experiences, teachers should better understand and observe the real needs, struggles and interests of the learners [16]. While respecting all privacy regulations, teachers can still use GenAI tools to estimate individual and group profile characteristics and to generate typical profiles, such as "persona", "value proposition canvas", user point-of-view statements, make fictional interviews and others. GenAI tools can provide teachers with reflections and insights into students' behaviour, comments or actions, proposing strategies for learners with special educational needs (SEN), improving learning adaptation and personalization.

3.2. Experience: Select the most appropriate learning approach

The next phase covers planning of the learning experiences. At this experience design stage, teachers have to define the general concepts of the specific learning experience, taking into consideration (1) the problem or topic complexity (structured/unstructured/complex problem), (2) the time for preparation and implementation (hours /weeks/ months); (3) the expected outcomes of the experience (open-ended or expected in advance). Experiential learning is part of the active learning methods [17], and is based on the constructivist theories of learning and "learning-by-doing" approaches. GenAI tools can support teachers to select or combine different approaches of the active learning methods such as inquiry-based learning (IBL), problem-based learning (PBL), project-based learning, case-based learning, and discovery [18], considering students preferences, contextual situation and others.

Table 1
Elements of the scenario design framework.

Learning experience design	Phase 1: Introduction	Phase 2: Planning	Phase 3: Implementation	Phase 4: Presentation
Main question	Why?	How?	What?	So, what?
Time-frame	1 hour	1 hour	6 hours	2 hours
Phase goals (Example)	Engage & motivate students	Plan the process	Perform the activities	Presentation, Reflection, Self-assessment
Activities (Example)	Investigate, Brainstorm, Put-in-the other's shoes	Explore procedures, methodologies, algorithms	Individual/Group work to collect and analyze data and observations	Presentation, Debriefing, Self-assessment
Learning materials (Example)	Video, Story-telling, media post (article)	Hand-out, To-Do lists	Hand-out	Hand-out, Self-assessment form
Digital tools (Example)	Video, media site, search engine	Digital planners, digital maps, search engines	Metering device, data analysis tools	Digital editors: presentation, video, comics, etc. social media
Student' feelings (Example)	Level of engagement, Level of interest, Motivation in the topic	Level of understanding and engagement with the process	Feeling of belonging, contribution to the process, achievement	Satisfaction, Achievement, Meaningful outcome
Challenges of the phase (Example)	Missing the importance, not interested in the problem, lack of confidence	Lack of patience - understanding the "big picture"	Students not involved in the process, Lack of materials, time, tools...	Lack of understanding the "big picture"
Gamification & engagement elements (Example)	Role-play, Treasury hunt (find all relevant issues), Escape room	Simulation, Exploration of real-world tools and methods	Collaboration, team-work games, time management strategies	Competitions, Public exposition of the results, feedback from stakeholders

3.3. Scenario: Design or select scenario for appropriate learning experience

The scenario approach provides a general framework for LxD, describing the main activities, resources, questions, tools, and reflections (table 1). Inquiry-based learning (IBL) is one of the most popular active learning approaches, aiming to apply the scientific method of hypothesis testing, experimentation, results analysis and evaluation [17, 19]. IBL is a learner-oriented approach, based on a structured or semi-structured scenario. Starting with engaging discussion, the IBL incites students to make suggestions, explore evidence, evaluate criteria, formulate explanations from available evidence, connect explanations to scientific knowledge and theories and finally communicate and explain their findings [19]. The IBL approach can be applied both for STEM subjects and social sciences [19]. According to educational research, there are four primary types of inquiry, based on the degree of students' autonomy [20]: (1) Structured inquiry, where the teacher introduces the problem, guides students and provides resources and feedback. (2) Controlled inquiry, where the teacher provides a set of questions and resources that students can choose from. (3) Directed inquiry, where the teacher introduces a broad topic and poses guiding questions, but students develop their research questions and projects, choosing resources. (4) Open inquiry, where students explore their questions, select resources, and decide how to present their findings with the teacher's support. Teachers can use GenAI tools to recommend appropriate IBL scenarios ensuring that the research topics can engage students in the Inquiry process. GenAI tools can estimate and personalize the topics of research to be both motivating and interesting for students and to be presented in an appealing way. GenAI tools can facilitate reflection sessions after each IBL phase, supporting teachers to prepare engaging and thought-provoking discussions.

3.4. Engagement and Motivation

Gamification techniques can increase engagement and motivation, making the learning process more social, meaningful and relaxed. Gamification can be applied in different disciplines at all educational levels [21]. There are two main pedagogical components: mechanical elements (rapid feedback, badges and goals, participation, and progressive challenge) and emotional elements (narratives and identities, collaboration and competition). GenAI tools can propose engaging and motivating gamification elements in every phase of the scenario design.

Table 2
Examples of the Scenarios, generated by the students with GenAI tools by choice.

Student/GenAI	Persona	Scenario/Active learning	Engagement & gamification	Sensory design
KS/ Individual/ ChatGPT	Maria, 12 y.o., excellent student in mathematics and painting; She's shy and speaks only to her best friend. She can have communication issues and a minor form of SEN	Combine math with design: colorful symmetry - geometry in the nature; describe axial and central symmetry in flowers, snowflakes, autumn leaves and others; Scenario can adapt for students with SEN	ChatGPT suggested gamified tasks and mini-games: find symmetry; paint a mirror reflection; describe symmetry in different objects; organize an exhibition of the final paintings, puzzles and others	ChatGPT provided a worksheet for working in class with half-colored templates so that students can symmetrically complete it
PS/ Individual/ Gemini	Mitko, 14 y.o., studies in German language school, positive, social, loves sport/football and racing cars /F1 racing	Design an IBL scenario combining Physics, Mathematics and German, using debriefing of a football team or F1 performance: calculate angles, speed, techniques	The class is divided on teams, each working on debriefing a video for DE football team/ DE F1 drivers; Several activities are organized in a group competition; Each group presents their findings and strategies for improvement	Design tasks for students with SEN – to design branded materials and to make posters of the teams
MS/ Individual/ Gemini	Martin, 16 y.o., study Spanish, good student; love sport/ football, languages, social, pro-active, kinesthetic	Design a 3 weeks challenge for Spanish football: learn vocabulary, geography, sport, history linked to football in Spain	Read Spanish newspapers/ Discuss sport TV Shows/ Football videos; Bonus: organize a real trip of the class to Madrid and visit a real football match	Print-outs and glossary for terms and football words; Posters for Spanish football teams
SM/ Individual/ ChatGPT	Alex, 16 y.o., problems with emotional intelligence and lack of communication skills	"Understand me to hear me": how to use AI to improve emotional intelligence and to manage conflicts	Individual and team activities in class, discussions and videos for human emotions, AI interview for managing conflicts, how to make emotional map; reflection	Print-outs for activities, emotional map, individual survey
MZ/ Individual/ ChatGPT	Mario, 14 y.o., loves video-games, you tube videos for technologies	PBL for 4 weeks: Programming an Arduino robot for demonstrating the main principles in mechanics – 1st and 2nd Newton laws; inertia, acceleration, centripetal force, friction	Team work; Planning and debriefing each week; Demo sessions; Retrospective meetings; Final demonstration	Preparation of Hardware and software components; guidelines for students' teams
DD/ Group activity/ Character AI, Canva Avatar, ChatGPT custom	A class of students in 8th grade - without personalization	"Teach your AI friend": Students have to design a friend and to "teach" him a specific issue	Students chat with a GenAI tool and explain a specific issue, related to their hobbies/interests; Then, they make a presentation, explaining their experience	Reflection list; Step-by-step approach
DaD/ Group activity/ Copilot, AI Fact Checker	A class of students in 10th Grade - without personalization	Critical thinking and fake news; Discover and explain;	AI Detective Game; Team work and challenges for identification of real and fake news; Explore deep fake;	Prepare templates; news/ real and deep fake; Reflection list

3.5. Sensory design

Sensory design involves the preparation of physical and digital learning materials and tools, supporting scenario implementation. The sensory design aims to stimulate learners' imagination, creativity and immersion and to provoke new metaphors and experiments. For example, classroom arrangements can facilitate debates, role-playing, and individual and group activities or modelling materials such as pasta, natural materials, office stationary tools, learning robots and others can assist the active learning process. Teachers can use GenAI tools such as Canva, ChatGPT, and SORA to design print-outs, presentations, videos and posters, both generating multimodal learning materials or giving ideas for engaging print-outs, digital tools and resources.

4. Testing and validation

To test and validate the pedagogical framework, an experiment is made with 7 BSc students from the pre-service teacher training program at the Faculty of Mathematics and Informatics at Sofia University. They applied the provided LxD framework, assisted by different GenAI tools – ChatGPT, Microsoft Co-Pilot, CanvaAI and others. Students were allowed to choose their own prompts, to design learning experience for individual or group learning scenarios. Based on the GenAI responses, students prepared final reports, reflecting on their experience with the learning experience design and opportunities for learning personalization (table 2).

5. Discussion

The validation round proved that the proposed pedagogical framework can support teachers to incorporate GenAI tools such as ChatGPT, Copilot and Gemini to design meaningful and engaging learning experiences. More importantly, this pedagogical framework focuses not on the final scenario, but on the process of designing complex and personalized learning activities. Even without providing any personal data, this framework can support teachers to use GenAI tools to improve understanding of their students and to increase learning personalization by making simulated personas and playing with possible scenarios, built on interests, problems and preferences.

- **Focus on the learner:** GenAI tools supported participants to create some very detailed persona profiles and value proposition canvas, getting specific aspects and interests.
- **Experience design:** GenAI tools suggested diverse active learning experiences for the selected personas/classes. All projects combined multiple active learning approaches such as IBL, PBL/Problem-based learning, STEAM, Game-based learning and others. GenAI proposed different points of personalization of tasks (combining mathematics and art, football and cars, football and Spanish, emotional and communication skills, chatbot/ robot programming).
- **Learning scenario:** GenAI proposed different learning scenarios for every project, ranging from one-hour in-class activity to several weeks or semester-long project. All scenarios provided detailed lesson plans with group activities and individual tasks, gamification and personalization elements.
- **Gamification elements:** GenAI suggested different gamification elements such as badges, leaderboards, group competitions, teamwork, rewards and feedback sessions and video games for facilitating the learning process. GenAI proposed possible scenario modifications, adding activities for students with Special educational needs (SEN).
- **Sensory design:** GenAI succeeded to enrich all LxD scenarios by generating specific print-outs, memory games, hand-outs, emotional maps, and digital materials, assessment rubrics, interactive presentations and others. It can be expected that multimodal GenAI will increasingly improve the quality of the learning materials, disposable in class.

At the end, one unexpected outcome in some of the projects was due to the fact, that some of the scenarios were too boy-oriented, risking to lose the attention of some of the students. Therefore, it will be a good reminder for teachers to pay attention that projects are equally interested for all students.

6. Conclusion and future work

The pedagogical framework for Learning experience design (LxD) can effectively integrate GenAI tools into classroom practice to support engaging and personalized learning strategies. By supporting teachers through five distinct stages, the framework helps to bridge the gap between innovative technologies and meaningful educational experiences. One of the most compelling insights from the study was that GenAI allow teachers to personalize learning by embedding students interests or struggles into classroom projects. This not only can increase engagement but also can facilitate inclusive learning experiences, reflecting the diverse motivations of learners. The ability of the teachers to tailor topics like science or history to students' shared interests – such as football or automotive technology – shows the potential of GenAI to foster creativity, relevance, and connection.

Moreover, the framework encourages a shift in the role of educators from content deliverers to designers of personalized and adaptive learning environments. The proposed pedagogical framework also reflects a pedagogical shift – from traditional instruction to design of learning experiences, from teaching to facilitating and mentoring, emotionally engaging and boosting the motivation of the learners, embracing diversity and making classes more inclusive for learners with SEN.

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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