Game-based Pedagogy in Teacher Training: Results of a Pilot Course

Sonia Palha, Anders Bouwer, Kristin Webb, Daan van Smaalen and Desiree Agterberg
Faculty of Education, Amsterdam University of Applied Sciences, Netherlands

s.abrantes.garcez.palha@hva.nl
a.j.bouwer@hva.nl
k.e.webb@hva.nl
d.van.smaalen@hva.nl
d.a.agterberg@hva.nl

Abstract: Game-based learning (GBL) and gamification can improve the learning experience of students by making learning more fun, interesting, and motivating. However, integrating games in practice is challenging for many teachers as it requires competences that not necessarily are part of their teaching repertoire. Game-based pedagogy (GBP) refers to the teaching methods and learning processes involved in learning with games. Research stresses the need for adequate professional development and teacher education on GBP. However, there is a lack of empirical knowledge on effective methods to prepare pre-service and in-service teachers for using game-based learning. The aim of our research is to gain insight into the design of effective GBP learning experiences for teachers. The guiding research question was: What design elements of a course on GBL impacted in-service teachers' GBP competences and teaching practice? We investigated this question in the context of a teacher education program in the Fall 2023. We conducted an empirical study in which a course on GBL was designed, implemented, and evaluated in practice. The participants were 16 in-service secondary teachers from different disciplines in secondary education, from which 13 agreed to participate in this study, and three course leaders. We investigated participants' and course leaders' experiences, participants' competences in GBP, the impact on participants' teaching practice and the way design elements contributed to it. The data consisted of participant reflections, transcripts from participants and course leaders' interviews and answers to a questionnaire. The data was collected and analysed using quantitative and qualitative methods between January and April 2024. Results reveal that in-service teachers' improved their competences on GBP and increased their use of GBL in practice. Qualitative data analysis provides insight into the course's design elements and on participants' learning process. This study contributes to GBP-education by offering a possible design solution and framework for developing effective teacher education.

Keywords: Game-based pedagogy, Game-based Learning, Gamification, Teacher Education, Course Design

1. Introduction

The potential of game-based learning (GBL) and gamification for education is widely recognized. Digital games improve the learning experience of students by making learning more fun, interesting, and motivating by engaging students in active learning or by involving students in new ways of learning (Barz et al, 2024; Luarn et al, 2023). However, integrating GBL in ways that fulfill these expectations is challenging for teachers (Hayak & Avidov-Ungar, 2020). It requires skills and knowledge that may not be a part of their teaching repertoire, such as being able to determine which games are suitable and/or can be easily adapted to their goals; to introduce the game activity to students and support students' learning while they are playing; and to attend to whether learners are connecting gameplay with the learning content and goals (Bado, 2022; Nousiainen et al, 2018). Several researchers (Foster & Shah, 2020; Bado, 2022) have called attention to this issue and the need for developing teacher education programs that introduce practicing and future teachers to the methods and knowledge required for GBL.

In the literature it is possible to find some heuristics for designing curricula for teachers on game-based pedagogy (GBP) (e.g., Bado, 2022; Avidov-Ungar & Hayak, 2023; Foster & Shaha, 2020). However, designing effective teacher education for GBP is complex and the methods and knowledge available for teacher educators is limited (Foster & Shah, 2020; Molin, 2017). For instance, there is little knowledge on evaluation instruments to guide student-teachers in the development of game-based pedagogy competences (e.g., Nousiainen et al, 2018) or to allow teacher educators to evaluate student progress and improve the course (Foster & Shah, 2020). In addition, teacher educators need training and support to develop their own pedagogical competence in game-based pedagogy (Avidov-Ungar & Hayak, 2023).

In the faculty of education of the Amsterdam University of Applied Sciences, a fully gamified one-semester course on game-based pedagogy was designed in the spring of 2023 for the master program of teacher education with the goal of introducing teachers to the pedagogical use of games. This course was built on a previous training track for mathematics teachers on GBP, the design of which was informed by the guiding

principles of Foster and Shaha (2020) and the competence framework of Nousiainen et al (2018) that was used to guide and evaluate competence development.

The aim of this study is to understand how the course impacted participants' competences on GBP and teaching with games. The course was followed in the Fall 2023 by 16 in-service teachers from different disciplines in secondary education. Through qualitative research methods we investigated how design elements of the gamified course and interaction with course leaders engaged participants in GBL and competence development. The guiding research question was: What design elements of GBL course impacted in-service teachers' GBP-competence and teaching practice?

2. Research Background

2.1 Game-based Pedagogy

Game-based pedagogy refers to the study of methods for instructing through games or gamification, encompassing both instructional objectives and the strategies employed to attain them. In the educational context, the instructor needs specific competences encompassing knowledge, skills, attitudes, and values to effectively teach with games or gamify activities, lessons, and courses (Nousiainen et al, 2018). These competences involve a favorable outlook on games, possessing subject expertise, employing effective teaching methodologies, and use diverse methods of incorporating games into the educational setting (Hayak & Avidov-Ungar, 2020). Nousiainen et al (2018) identified four main areas of teacher competence in GBP and respective dimensions. *Pedagogical area* involves curriculum-based planning or understanding how to effectively convey curriculum content through various GBL methods. *Tutoring* in GBL refers to guiding learners through game-based activities, incorporating motivational techniques and supporting students' autonomy. Assessment in GBL encompasses evaluating student learning and engaging in reflective discussions with them. *Technological area* requires knowledge of games and available tools and the ability to continuously evaluate tools (because sometimes ideal solutions are only found after less successful attempts) and flexible handling of technical obstacles. *Creative area* includes adopting a playful stance that allows one to see playfulness in almost any learning activity and it entails exploration and improvisation, where one can freely experiment with novel tools and approaches. It also involves creative orientation to self-development, a willingness to constantly refine one's skills in GBP while reflecting on and refining their teacher identity. *Collaborative area* encompasses the ability and willingness of teachers to collaborate and co-create within the school and the ability to share and co-develop outside the school and network.

2.2 Guidelines for Teachers' Professional Development in GBP

Research on teachers' use of GBL provides directions about the content for teacher education on GBP. A few directions that can be deduced include: planning for integrating GBL in the curriculum with analysis of the strengths and limitations of a game in relation with curricular goals and in relation to the school ecology (Herbert and Janson, 2019; Foster & Shah, 2020); playing games often and of a wide variety so teachers can develop a sense of familiarity with games and their potential for supporting curricular goals (Molin, 2017; Foster & Shah, 2020); distinguishing between different approaches to GBL (entertainment, educational, making games) and gamification of learning as requiring different pedagogical approaches (Nousiainen et al, 2018); and introducing teachers to pedagogical activities specific to GBL and systematic procedures that can guide them through the different aspects of using games before, during and after game-based lessons (Bado, 2022). Having teacher educators modelling the use of games has been found to be a factor that positively influences teachers to use games in their practice (Avidov-Ungar & Hayak, 2023). These findings suggest that an effective way to expose teachers to game-use is by having them participate in a gamified course.

2.3 Gamified Design of a Course on GBP for Teacher Education

The design of the course was based on theory about gamification, which is defined as the use of game design elements in non-game contexts (Deterding et al, 2011; Luarn et al, 2023). From a designer perspective, gamification includes elements from games (e.g., choice, competition) but not a full 'game proper' such as in the cases of serious games and entertainment games. From the user perspective, such a system can be experienced as 'games proper' and enact gameful and playful experience. Game design elements are meant to create gameful experiences and can be identified on varying levels of abstraction. Ordered from concrete to more abstract, Deterding et al (2011) distinguished: (i) interface design patterns; (ii) game design patterns or game mechanics;

(iii) design principles, heuristics or lenses; (iv) conceptual models of game design units; (v) game design methods and design processes.

In the design of the course, we used several design elements (see section 4.2). One of them was a skill tree, which is a collection of gamified pathways integrating educational objectives and content and organized in a playful way (Backlund et al, 2021). The skill tree offers multiple options to go from start to end, providing freedom to players to pursue their interests, fostering agency (Backlund et al, 2021). In the course the tasks in the skill tree were connected with points, levels, and scores to improve the gamified experience. Figure 1 shows a simplified version. To see the full skill tree (in Dutch) go to https://edu.nl/jrwya.

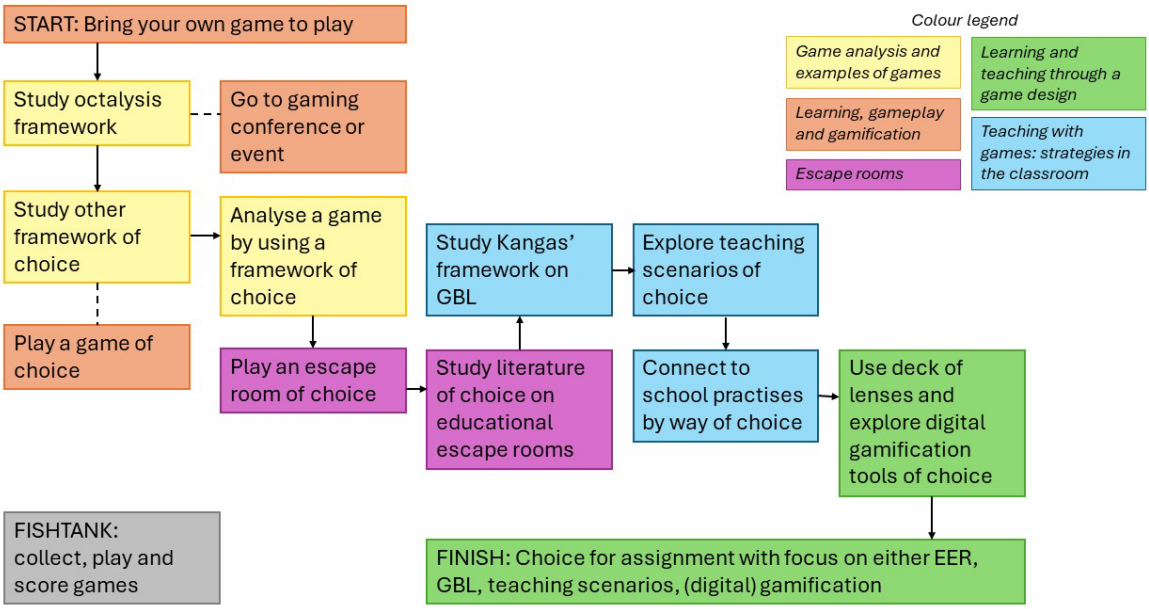

Figure 1: Simplified version of the skill tree

3. Method

3.1 Participants

The study participants were 13 of the 16 in-service teachers participating in a master's course on GBP and the three course leaders. They were experienced teachers (6 to 20 years) in secondary education from different disciplines. For the rest of the paper, reference to teachers means "in-service teachers." The course lasted one semester (September 2023 to January 2024); the participants had lessons every fifteen days and were expected to work in transdisciplinary teams of four on designing and developing their own game during the off weeks. The skill tree (Figure 1) was used to guide both the lessons and independent group work. The final assessment consisted of the developed game and an individual reflection.

3.2 Data Collection

The data was collected using instruments that were developed in a previous research and adapted by the research team: individual reflection, teachers' competences questionnaire, participants' interview guidelines, and course leaders' interview guidelines.

Individual reflections are text documents in which the participants reflect on their learning process within a transdisciplinary team. The reflection instrument has been used by the teaching education program for two years.

The *competences questionnaire* was a digital document containing the description of the GBP competences (see 2.1). In the first question, the participants could choose one of the options (not, few, some, fairly, a lot) to indicate the extent to which they felt competent in each of the GBP competences. In the second question, they could indicate to what extent the course had contributed to their development in the same dimensions. In the

last question, the participants could indicate which components in the course had contributed to their growth in GBP competence (open question).

The *interviews with the participants* were designed to get a deeper understanding of the design elements' impact on their competence growth, and school practice, and to collect additional information about the their background.

The *interviews with the course leaders* focused on their experience with the course and the roles of the different elements and activities in it.

The participants' individual written reflections were collected after course completion, in January 2024. In February 2024, all participants were invited via email to answer a questionnaire and participate in the interview. Ten participants answered the questionnaire and five of them agreed to be interviewed. The interviews of the teachers and course leaders were conducted individually in March-April 2024 and took about 30-50 minutes. They were video or audio recorded and transcribed.

3.3 Data Analysis

The analysis of the competence questionnaire was quantitative, the reflections and transcripts of the interviews were analyzed qualitatively. In the first step, we went through the documents and identified text passages regarding each of the four variables in study. The result is a document that provides a rich description of each teacher's experience with the course, their actual competence on GBL and feeling of competence growth, actual use of GBL in their own practice and on the elements of the course that they considered to have contributed to it. Each participant got one single code; we used the letter 'S' followed by one number to designate each in-service teacher (e.g., S2) and we used the letters 'CL' to designate the course leaders. In the second step we focused on the design elements and for this we used the definition of design elements (Deterding et al, 2011) and levels of game elements.

4. Results

4.1 Impact of the Course

4.1.1 Teachers' Experience with the Course

Teachers indicated that they enjoyed and learned a lot from the course: 'All in all, I thought it was a complete course in which attention is paid to the literature and the substantiation of why you could do this. There is also a lot of room to try something out experimentally and to see what the effect is and where are the snags' (S2). The good atmosphere in the classroom and within the teams and the relationship with the course leaders was much appreciated. For example, S3 tells how in her group they share their passion for playing and could count on each other: "The atmosphere was relaxed, with a lot of humor, understanding for each other and especially enthusiasm. All of us have made a positive contribution to that." S10 mentions how he had fun designing their game and learned new content from it: "We searched for typical medieval names to hang our story on. That brought with it the necessary funny moments. In addition, we also had to look for typical medieval customs and cultural aspects to give our story 'body'."

Teachers described gameful experiences: "Getting a sea of ideas and then unpacking what you like" (S15) and "There was an element of play in every lesson, an opportunity to share or exchange something with the group" (S3). They also mentioned feeling connected as a community: "By working in this way, you form a community in which you can share, learn, question and give feedback and I think it's great that I am part of that" (S3). The way of working with a lot of freedom of choice to delve into what they found interesting was much appreciated. But there were also moments of uncertainty and tension. For example, it took time for S11 to get used to the freedom for experimentation and discovery and S10 felt out of his comfort zone because he worked with multidisciplinary teams, while in his school he gravitates towards his own department. Frustration was also experienced in very small sizes. For instance, for S2 the fact that their game was not finished was a shame: "Too much time was put into it and yet it didn't work". S11 also had a negative experience with the assignment, although her group made a full game, she says it took too much time to design.

4.1.2 Teachers' Competence Growth

The results of the competency questionnaire are given in Figure 2. Teachers reported growth in all four areas. Most of the growth concerns the *Tutoring,* which is the implementation of game activities (pedagogical area), *playful stance* (creative area) and analyzing *game and tools* (technological area). Teachers referred in the interviews and reflections that analyzing games and tools provided them with more knowledge about the background of games and underlying learning processes. For example, S11 now sees that games rely much more on problem-solving skills and S15 finds himself more skilled in examining games and identifying why something works or does not work. Regarding *curriculum-based planning,* teachers mentioned their difficulty in implementing full games: "It takes a lot of time, and it is difficult to link with the content" (S13).

The least growth was in the *flexible use of ICT* and *networks outside the school*. When asked for the reason, teachers mentioned that these skills were not really incorporated in the course.

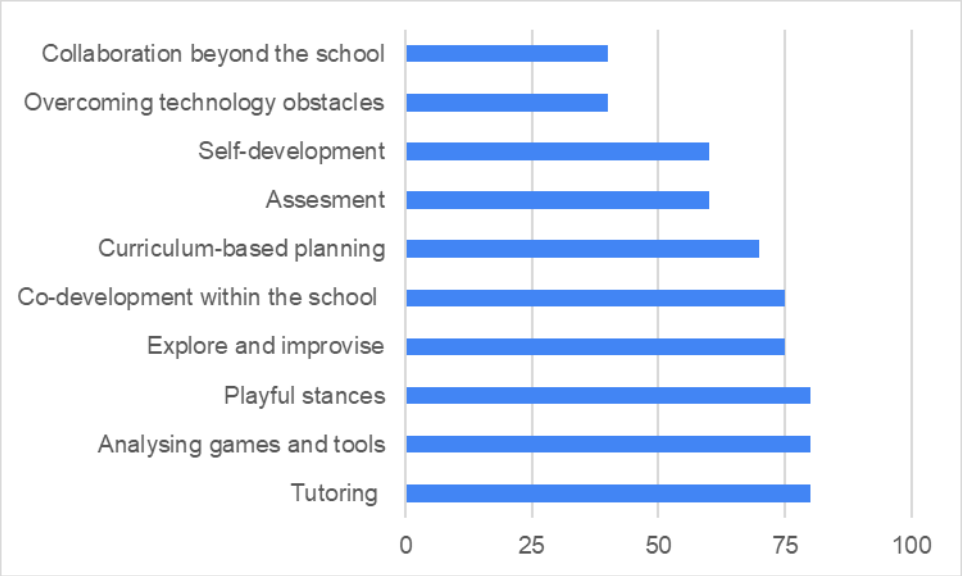

Figure 2: Growth by competence dimension

4.1.3 Teachers' use of GBL in School Practice

Several teachers used the same or similar game activities offered by the course leaders in their own classes. For instance, S1 adapted the break-in room activity and used it with her own students as exam review. Some teachers integrated modified game activities in their actual teaching: "Two weeks ago I recreated a board game of 30 Seconds with the Roman Empire in the background" (S2). The 30 Seconds game was developed by one group of teachers during the course. Teachers have also created new games themselves and/or together with other teachers at school. For example, S11 has made a board game about exploration with a geography teacher, and she has made a trivia board game for history herself. S11 regularly uses the online tool Genially in her lessons to create escape games with her students. Her students make the questions and answers, and S11 finalizes them into an escape game for the class.

Teachers also experience obstacles when trying to implement GBL in their practice: "It is difficult to work within a team, because you would like to develop something together but how do you take a team that doesn't want to cooperate?" For this, S2 feels that he has been offered few tools or strategies during the course.

4.1.4 Course Leaders' Experience With the Course

All course leaders were positive about their course experiences. Some aspects that could be further improved in the course design include more scaffolding during the design of the games, the layout of the skill tree, and further aligning the assessment with the content of the course.

When asked what kinds of elements or activities they found most useful and why, the course leaders noted: "The whole combination had a nice effect" (CL1); the variation was impactful because "...we wanted to expose the students to as many variations of gamification as possible" (CL3); and the skill tree because it allowed for

"pursuing individual interests" (CL1) and "promoted autonomy" (CL2). The collective game activities were important as they "led to engagement, teachers experienced more fun, interaction, and challenge, and learning beyond their own perspective" (CL1). Also, there were spontaneous activities coming up themselves and all course leaders embraced them: "Leaving space for such things to happen is important" (CL1). Finally, chance elements, e.g., using dice or doubling points by surprise are important because chance is a very important element in many games (CL2).

4.2 Design Elements for Teachers' Professional Development in GBP

Teacher learning experience and impact on their school practice were analyzed in relation to the course's design elements as explained in the method section. This led to the categorization presented below. Each design element described was mentioned by at least one teacher.

*Game interface design patterns c*onsist of design components and design solutions, including prototypical implementations. Teachers referred to the *point count, leaderboard* f*or each class and prizes* and a *skill tree*. These elements had a strong effect on the gameful and playful experience: "There was a play element in every lesson" (S3); "The lectures started with game music" (S15). They also impacted teachers' school practice, for instance S11, a history teacher, adopted the idea of points and prizes, sometimes a chocolate bar, sometimes a carrot, in her teaching. The skill tree "felt like a game" (S15) but it had a deeper impact on teachers' learning: "We were able to deepen the theory at our own pace because of the skill tree. This creates freedom and gives opportunities to gain your own insights about the various parts within GBL" (S1). The skill tree element was mentioned by almost all teachers for similar reasons.

Game mechanics involves parts of the design of a (game) activity that concern gameplay for learning. Teachers referred to seven mechanics: (1) G*o deeper into any subject of own interest* within GBP. They could choose one of the many activities in the skill tree or add their own; in both cases they would get points for it. Teachers' choices were varied. For instance, S3 went deep into the theoretical background about GBL through seeing videos while S9 preferred to read the book *A Theory of Fun*. (2) *Analyzing a game* was modeled in the lesson. Teachers could then use other models presented in the skill tree. S11 used Octalysis to analyze the game Assassin's Creed because she was curious to know about the learning value of this game for her discipline (history). (3) *exploring examples of gamified activities* with digital tools, such as Blooket and Genially presented by the course leaders and other tools at their own choice. (4) *Activities connected with informal contexts*. For instance, S13 liked the activity bring your own game "because then everyone shows their own game and you also learn from that analysis." (5) *Playing a variety of games* was perhaps the most present mechanic throughout the whole course: "The course started with a kind of escape room where you had to look for a code to enter the room. It was an unexpected first lecture which immediately fueled my enthusiasm and curiosity for the coming weeks" (S1). (6) *GBL modeling*: "We played an escape room together, in which the offered theory of game-based learning was incorporated. Our teacher had made this [escape room] with everyday materials like cups and folders and easy games like memory to show how simple such a thing can be. I immediately took her idea and applied it to a grammar lesson in French about conjugating verbs" (S3). (7) The *questionnaire on GBP competences,* was used by the participants in one lesson activity to get insight into the competences of their team. S2 found this activity "very instructive because it forces you to start thinking, 'Where does your affinity lie and what can you already do?'"

Game design heuristics are evaluative guidelines to approach a design problem or analyze a given design solution. The objectives of the course-design were *enacting gameful and playful experience*; *competence growth* and foster teachers' *Integration of GBL in school practice; collaborative learning* across disciplines. The first three heuristics have already been extensively discussed in section 4.1. Regarding the collaboration aspect, the participants learned a lot (and had fun) from working together: "It was instructive to see how others approach something, such as making a puzzle for an escape room, but also how pressure is handled".

Learning-by-games models refers to the conceptual models relating components of games, learning and gameful/playful experience. Teachers referred to the Smiley (Weitze, 2017) and Octalysis (Chou, 2019) models, both introduced in the lessons in connection with game analysis. For instance, one teacher found the Smiley model a good basis to understand the value of games for education, "to see what games do and how we could possibly use it".

Game design methods consist of game design-specific practices and processes. In our case: (1) *playtesting own designs in class with fellow students:* "I shared with the group how I had handled this, how much time it had taken, how the students had reacted to it and what I learned from it. By working in this way, you form a

community" (2) *Experimenting with (own) games in own school practice*. An example is that S11 carried out the assignments from the skill tree related to educational escape rooms with her students. In addition, during a project week, she gave her students the assignment to build an escape room themselves. (3) Teachers' could *present their projects* or working progress or any game activity that they had tried in their practice or would like to do: "I thought it was great that we all got the chance to use part of the lesson for a short presentation/workshop/game so that you also knew how the other groups approached things and you could get feedback yourself".

An overview of the design elements mentioned by the teachers and organized per level is presented in Table 1.

Table 1: Levels and elements for the design of a course on GBP

Levels of Elements	Game Design Elements
Game interface design patterns	• Point count, leaderboard, and prizes • Skill tree (on paper)
Game mechanics	• Deepening own interest • Analysing a game • Exploration (e.g., tools for digital games) • Connection with informal context • Playing a variety of games • GBL modelling by course leaders and group members • Scanning GBP-competences
Game design heuristics	• Gameful and playful experience • Competence growth • Integration of GBL in school practice • Collaborative learning: other perspective or strategy, responsibility; choice
Learning with game models	• Smiley model (Weitze, 2016) • Octalysis model (Chou, 2019)
Game design methods	• Playtesting own designs in class with fellow students • Experimenting with (own) games in own school practice • Teachers' presentations

5. Discussion and Further Research

The aim of this study is to understand the way design elements of a course on GBP for teachers impacted their competences on GBP and teaching with games in practice. First, through qualitative analysis, we identified a set of design elements (Table 1) that contribute to this. These design elements are in line with research on gamification (Luarn et al, 2023). We extend previous research by providing knowledge on how these design elements encouraged learners' motivation, perseverance and socialization which is needed to develop effective gamified courses. Effective gamification elements go beyond merely adding points, levels, and rewards to content. It also provides challenges and feedback, along with interaction, which encourages learners to play for mastering content and skills, to overcome difficulties, and to socialize with others (Luarn et al, 2023). Our hypothesis is that the level categorization of the design elements supported with the examples developed in this study can provide guidance for designing gamified teaching programs. Future research should explore and test this supposition.

Second, we increased our understanding of how design elements engage learners and course leaders throughout the course. One major challenge in designing motivating GBL interventions is to integrate learning content seamlessly with game elements (Barz et al, 2024). We found out that *game interface design patterns* provide scaffolding of the course content, helping the learner to structure their own learning path and make decisions aligned with the course goals. This finding resonates with Luarn et al's (2023) suggestion that a gameful design means to help students gain more control over their performance and progress. G*ame mechanics* (e.g., deepening own interests, playing a game) enacted learners' gameful- and playful-ness (Deteringen, 2011), which

probably intrinsically motivated the learners to work towards the learning goals (Luarn et al, 2023). *Learning with game model elements* (e.g., Octalysis) has helped learners to understand the learning mechanisms behind games. *Game design heuristics* defined not only the design of the course but the way course leaders interacted and supported learners through the course. For instance, by modeling game-based learning (e.g., playing an escape room in the lesson) and gamification (e.g., the skill tree) course participants get first-hand experience, leading to increased confidence with GBL (Avidov-Ungar & Hayak, 2023). *Game design methods (*e.g., experimenting with games) provided space for learners to experiment and share experiences. Giving space for learners to contribute to the lesson even when unexpected seemed important for participants' engagement. The course leaders praised any attempt of the learners to share or to contribute to the lesson and had allocated time in the meeting for this when asked. This could be included as the fifth design heuristic in Table 1.

Reflecting on the methodology in the current study, the small sample and the fact that the participants chose to attend a course on GBL likely resulted in a sample that is already interested in, and potentially biased toward, GBL practices. In addition, the teacher educators had experience using GBL in their practice, which is not representative of teacher educators in general (Avidov-Ungar & Hayak, 2023). An additional study using mixed methods would be valuable to understand the impact of the course by a more representative sample of in-service teachers and teacher educators.

References

Avidov-Ungar, O., Hayak, M. (2023) "The Use of Digital Games by Teacher Educators in Colleges of Education", *Journal of Information Technology Education: Research*, Vol 22, No. 1, pp 373-387. DOI:10.28945/5191

Backlund, P., Erlandsson, P. and Andersson, J. (2021) "A Skill Tree Method to Identify and Map In-game Skills to Out-of-game Contexts", Paper read at XVth ECGBL, University of Brighton, UK, September.

Bado, N. (2022) "Game-based Learning Pedagogy: A Review of the Literature", *Interactive Learning Environments,* Vol 30, No. 5, pp 936-948, DOI:10.1080/10494820.2019.1683587

Barz, N., Benick, M., Dörrenbächer-Ulrich, L., & Perels, F. (2024). "The Effect of Digital Game-Based Learning Interventions on Cognitive, Metacognitive, and Affective-Motivational Learning Outcomes in School: A Meta-Analysis", *Review of Educational Research*, Vol 94, No. 2, pp 193-227. DOI:10.3102/00346543231167795

Chou, Y. K. (2019) *Actionable Gamification: Beyond Points, Badges, and Leaderboards,* Packt Publishing Ltd, Birmingham.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. (2011) "From Game Design Elements to Gamefulness: Defining 'Gamification'", In Proceedings of the 15th MindTrek, pp 9-15, September.

Foster, A., and Shah, M. (2020) "Principles for Advancing Game-based Learning in Teacher Education", *Journal of Digital Learning in Teacher Education*, Vol 36, No. 2, pp 84-95.

Hébert, C., and Jenson, J. (2019) "Digital Game-based Pedagogies: Developing Teaching Strategies for Game-based Learning", *Journal of Interactive Technology and Pedagogy*, Vol 15.

Hayak, M., and Avidov-Ungar, O. (2020) "The Integration of Digital Game-based Learning into the Instruction: Teachers' Perceptions at Different Career Stages"*, TechTrends*, Vol 64, No. 6, pp 887-898.

Luarn, P., Chen, C.C. and Chiu, Y.P. (2023) "The Influence of Gamification Elements in Educational Environments", *International Journal of Game-Based Learning,* Vol 13, No. 1, pp 1-12.

Molin, G. (2017) "The Role of the Teacher in Game-based Learning: A Review and Outlook", *Serious games and edutainment applications*, pp 649-674.

Nousiainen, T., Kangas, M., Rikala, J., and Vesisenaho, M. (2018) "Teacher Competencies in Game-based Pedagogy", *Teaching and Teacher Education*, Vol 74, pp 85-97.

Weitze, C. L. (2016) "Designing for Learning and Play—The Smiley Model as Framework", *Interaction Design and Architecture(s)*, Vol 29, pp 52-75.