Gamifying Feedback for Student Engagement in Research Modules: A Design-Based Research Approach

Joalise Janse van Rensburg

The Independent Institute of Education, Emeris, Faculty of Education, Cape Town, South Africa

Abstract

Designing engaging learning experiences present new challenges especially in contexts where generative AI can be used to complete academic work. This is particularly concerning in research modules where most assessments are text based. Furthermore, providing detailed feedback on informal activities can unintentionally result in students disengaging. They may use the feedback as prescriptive instructions for formal assessments as opposed to actively engaging and interacting with the lecturer and their peers as part of the learning process. This study presents the design and first implementation of a series of activities grounded in experiential learning to gamify feedback in research modules. A Design Based Research approach was adopted to develop and create an artefact by positioning the educator as designer and implementer. Data to refine the artefact was generated by means of expert critique and a structured reflection organizer informed by experiential learning theory and gamification design principles. The findings provide insight into the design process and design choices made to create the artefact aimed at gamifying feedback in research related modules. This study contributes to investigations into practical approaches to possibly improve student engagement and assign value to human interaction and engagement in the learning process.

Keywords: *Gamification, Research Modules, Feedback, Reflective Design*

1. Introduction

A challenge that many Higher Education lecturers face is sustained student engagement [1], [2]. There are two factors that make student engagement especially challenging in research modules where most assessments are text-based and submissions are iterative in nature [3]. The first is Generative Artificial Intelligence (GAI) because students can easily outsource their thinking and work without truly engaging in the learning process [4]. The second is lecturer feedback, not only is it possible that feedback is provided on GAI text with limited to no student engagement, but students may also use the feedback as prescriptive instructions for formal assessments as opposed to actively engaging with the lecturer and their peers during the iterative research process. Gamification of educational content has been found to increase student engagement of which one strategy is using rewards to recognise student effort [1]. This study specifically focussed on designing an artefact to gamify feedback in research modules by rewarding and recognising student engagement. Li et al. [1] explain that developing and implementing gamification could be complicated and suggest that the game mechanics, elements, and structure first be established before including subjective aspects like player experience. Thus, this study was exploratory in nature and focused on developing an artefact to address student engagement in research modules through reflection and expert critique which could be used for formal testing.

2. Design Based Research

Design based research (DBR) is a methodological approach that is systematic and flexible, with the intention to improve current practice by designing interventions to solve real world problems [5], [6]. Characteristics of DBR include grounding in pedagogical theory, considering context, iteratively analysing, designing, implementing, integrating different methods, and practical solutions [5]. During the process the researcher is responsible for systematically designing and implementing interventions to determine how the design could work and why [6]. In DBR the researcher holds multiple identities which ensure an in-depth understanding of the design and process [7]. In this study, the researcher was the lecturer, designer, and implementer. Different authors suggest variations on the phases of DBR, in this study the phases identified by McKenney and Reeves [8] were applied. The three phases include analysis and exploration, design and construction, and evaluation and reflection, which are revisited regularly throughout the design process [8]. McKenny and Reeves [6] discuss two types of evaluation,

formative and summative, as well as three types of testing, alpha, beta, and gamma. For the purposes of this study, only formative evaluation and alpha and beta testing were applied. The reason is that summative evaluation and gamma testing focus on assessing and testing a highly stable version of the artefact [6] whereas this study focused on the initial development and first implementation. Thus, for formative evaluation, one explores how the design could be improved [6]. Alpha testing concerns the logic of the design and its internal structures to determine the artefact's soundness and feasibility [6]. Beta testing considers its use in context without formally testing it [6]. The formative evaluation and alpha testing were done through developer screening, the researcher's reflective notes, and expert appraisal, individual expert critique, and feedback [6]. The reflection was guided by a structured reflective organizer which was informed by Experiential Learning (EL) theory and gamification principles. It also included four perspectives: lecturer, designer, implementer, and researcher. As recommended by McKenney and Reeves [6] the researcher engaged in a social reflective process with the experts but also more importantly solitary reflection regarding the artefact's meaning and application. Figure 1 illustrates a summary of the process followed in this study.

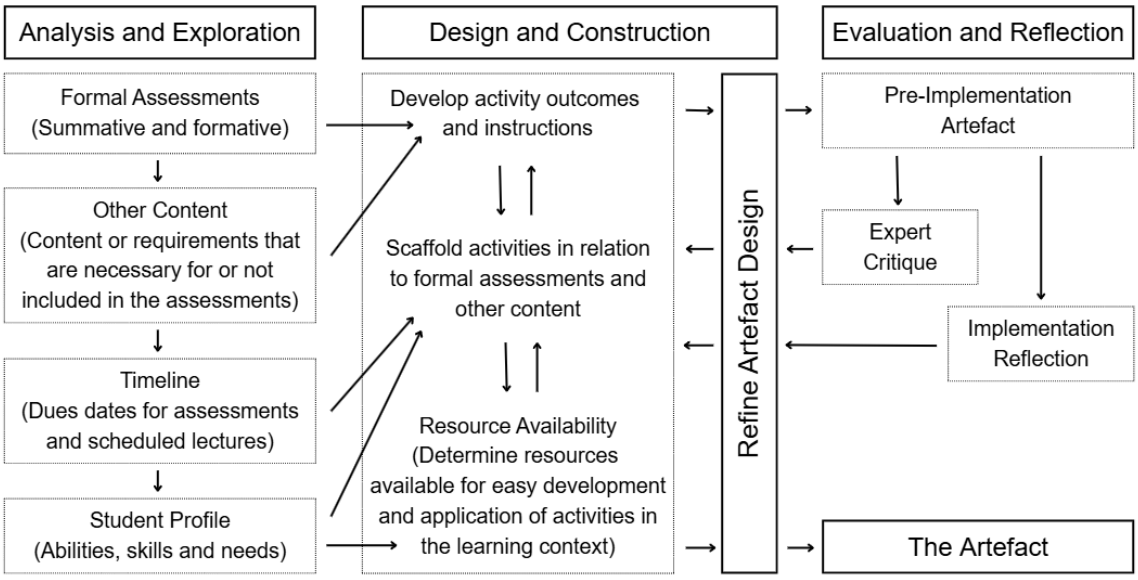

Fig. 1 The Design Process

What is not evident in Figure 1 but necessary to mention is the selection of a pedagogical approach before the research commences [5]. In this study, the pedagogical approach was EL, which was further supported by gamification principles. In the remainder of this article, the theoretical grounding will be discussed as well as each phase illustrated above and finally the artefact that this process yielded.

3. Theoretical Grounding

EL and Gamification formed the theoretical grounding that guided this study in the design process and during reflection. For EL theory the philosophical understanding of John Dewey is discussed as it has a stronger focus on the educator's role in planning and developing educational experiences. Gamification principles are also briefly addressed together with which were applied in the artefact.

3.1 Experiential Learning

John Dewey, the foundational philosopher of EL, argues that true and valuable learning occurs when students are actively engaged and involved in their environment, encounter obstacles, and reflect on outcomes [9]. Knowledge and skills are developed and applied through direct and meaningful experiences where interactions are planned and facilitated by an educator [10]. It is necessary to note that the experience on its own is not enough to guarantee learning, it requires structure and reflection to ensure its educational value [9]. Experiences could also be mis-educative if they do not provide a platform for further growth and learning or do not meet the required learning outcomes [11]. Dewey suggests two principles for evaluating experiences: continuity and interaction [9]. Continuity relates to

the conditions the experience creates to inform and affect the quality of future experiences for further growth and learning [11]. Interaction involves how the students' internal needs, desires, and capacities, and the external environment shape their experiences [9], [11]. Thus, the educator needs to know the context where the learning objective needs to be achieved as well as how it should be scaffolded for continuous learning [9].

In this study EL theory was the pedagogical approach used to develop scaffolded activities. One of the key components of EL is an educator who is knowledgeable in the subject matter as well as the students' readiness [12]. This is to ensure that the experiences are within the students' capabilities but also relevant to the module content [12]. Firstly, the researcher-designer, who is also the lecturer for the research module, considered the students' knowledge at every given point in the scaffolded process based on her previous experiences. In this way, she was able to ensure the continuity of the activities by designing it so that one learning experience informs, builds towards, and affects future experiences. Secondly, the researcher-designer's knowledge of the general student in these modules assisted with designing relevant activities. Understanding where the students should be in the research process and what they would need to continue to the next part, informed how the experiences were designed to ensure optimal progression. EL further informed some of the structured reflective organizer elements, these were learning outcomes, continuity, interaction, lecturer role, learning mechanics, intended experience, and enacted experience. EL also allows room for adapting experiences to ensure that the desired outcomes are reached, any such instances during the design process and reflection were noted by the researcher during the artefact development.

3.2 Gamification Principles

Gamification is the strategic use of game design elements, mechanics, and principles in non-game environments, like classrooms [14], [15]. The intention of gamifying educational content is to motivate students to achieve learning outcomes and increase engagement during their learning journey [15], [16]. The fundamental components that make games fun include game mechanics (non-player characters, points, turns, rewards, avatars, levels, badges, challenges/quests, leaderboards), learning mechanics (task, demonstration, educational tutorial, assessment feedback, reflect/discuss), and game aesthetics (narrative, sensation, audio, fantasy, challenge, fellowship) [14], [15]. Students generally find gamified educational content more engaging, and most studies conclude that it has an overall positive effect on the learning experience [1], [2], [15], [16], [17]. Gamification is more likely to be effective when the experiences are designed to meet students' needs and expectations [17] which relates to EL as a pedagogical approach. With regards to the educator, their willingness and skills, and the resource requirements to use the gamified elements, impact the application and implementation in the classroom [15].

In this study, rewards were used as the main game mechanic, tasks, discussion and reflection the learning mechanics, and challenge the game aesthetic. Students were rewarded with tokens for engaging with the content when posting ideas on a discussion board and then discussing it in class to 'buy' deeper levels of feedback. One could consider openly sharing research ideas with peers as the challenge aspect. Furthermore, games generally have rules and actors who attempt to achieve a goal by obeying the rules [16]. In this study, the 'rules' are the scaffolded instructions and experiences that students, actors, must complete to progress through their learning journey. Triantafyllou et al. [17] state that gamification can encourage both intrinsic and extrinsic motivation. For the most part the artefact in this study relied on extrinsic motivation that was driven by rewards for engagement. This relates most to what Triantafyllou et al. [17] call 'missions' and 'virtual goods' where students have certain goals for which they receive rewards. Since the researcher-designer is also the lecturer, the educator's willingness and ease of use was not a challenge, and resource availability was considered during the design to ensure easy implementation.

4. Analysis and Exploration

There were four distinct aspects analysed and explored to design the artefact: formal assessments, other content, timelines, and student profile. Each element in this phase was considered individually and in order from top to bottom as indicated in Figure 1. First the formal assessments, this included summative and formative assessments which have an impact on a student's final grade, these were considered to establish the milestones and final requirements of the module. In this specific case a Research Proposal was the summative assessment, and a concept document, literature review, and ethics application the formatives. Thereafter, other content and requirements were considered which

students must complete but are not included in the formal assessments. In the research modules where the first implementation took place, this was mostly focused on the memorandum of understanding that a student and supervisor must sign. The next important aspect was the timeline; this was impacted by the due dates for the formal assessments and the frequency and number of lectures scheduled. Lastly, students' abilities, skills, and needs were also considered from the researcher-lecturer's experience. Generally, the students' research abilities and skills are very limited, previous cohorts have differed slightly but usually one would need to start with the basics. Regarding needs, the students usually want the fastest route and only later realize that working consistently throughout the semester is required. The aspects of the research process that students tend to struggle with most include committing to a topic and focus, ensuring the study is feasible and valuing and applying feedback. The analysis and exploration of these aspects during the initial phase of the study informed the choices made during design and construction.

5. Design and Construction

There were three main considerations related to the design and construction: the activity outcomes and instructions, activity scaffolding, and resources availability. These considerations impacted one another during artefact development. Initially the activity outcomes and instructions were considered, and this was based specifically on the formal assessments and other content. While these activities were developed the options for scaffolding were explored and informed by the timeline and student profile. In this specific study the available resources were not considered during the first phase, analysis and exploration, but rather after there was a basic idea of the scaffolded activities and what would be required. This was to decide whether the available learning management system (LMS) could be used or if external tools should be considered. After exploring some external tools, it was decided to develop the artefact in the available LMS to ensure ease of management and support. For the students and lecturer, it meant that all academic work and activities are in one place and for the lecturer if any challenges arose there was support available on campus. For this specific artefact the discussion board tool as well as file submissions were used for the submission of work and the grade book with formula columns were used for managing rewards. Students would receive feedback tokens if they participated and submitted the required work. For some of the token activities it was necessary for students to discuss their thoughts and ideas in class to receive the maximum tokens available. Tokens were awarded by allocating marks for submissions and participation in class discussions and could be exchanged for deeper levels of feedback on formative assessments. The number of tokens received and used were captured in the gradebook where a formula calculated the remaining tokens per student. This yielded the pre-implementation artefact that was discussed with the experts in the evaluation and reflection phase.

6. Evaluation and Reflection

The evaluation and reflection phase included expert critique on the pre-implementation artefact and reflection by the researcher during the entire research process. Ethical clearance was obtained from the researcher and experts' institution before discussions started. The experts were purposefully chosen and recruited to participate in an in-person discussion of the design and included lecturers who taught similar research modules. These discussions were recorded, transcribed, and notes were taken by the researcher. This is considered data collected for artefact refinement. The researcher, who is also the lecturer, designer and implementer, kept reflective notes throughout the entire process. The reflective notes were structured according to a structured reflection organiser that was created using EL and Gamification principles. These reflective notes are also seen as data that was collected to refine the artefact. After receiving the expert feedback and during implementation the artefact was refined by going back to the design and construction phase. Expert critique included suggestions to scaffold some activities differently, incorporate visual and aesthetically pleasing elements and considering alternatives for token calculation. Reflection also yielded additional possibilities regarding the use of badges, levels, quests and leaderboards. The artefact was refined and adapted based on the expert critique and reflection, but major changes did not form part of the first implementation as to not confuse students during the semester. Changes that were made during the first implementation included shifts in due dates and adapting instructions for changes that occurred in the institution and clarity.

7. The Artefact

In this section more detail is provided on the design and logic of the artefact. Firstly, the context specifics will be highlighted, thereafter the scaffolded activities discussed followed by reflective insights gained from the study with a generic structure that could be adapted and applied to other contexts.

7.1 Context Specifics

The module for which the artefact was designed is a research module for post-graduate diploma students in computer science of which the group size is 20-30 students. They generally completed an undergraduate degree the previous year, most of them in computer science but there are usually some students with other undergraduate degrees. All students must have some programming background to study the post-graduate diploma. At the end of the semester students must receive ethical clearance from the institution for their study and submit a research proposal to continue with research and complete a research project in the following semester. These students are generally comfortable with technology, but their research experience is very limited. This means that the module is considered their first introduction to the academic research process. The researcher has taught the module for three years and has experienced a decline in student engagement, in some part due to in-depth feedback provided on submitted documents: the students do not see the value of coming to lectures if they get in-depth guidance on submitted text. The researcher is also comfortable with the institution's LMS which assisted in easy develop the artefact.

7.2 The Scaffolded Activities

In the artefact there are three types of assessments: token activities, formative assessments, and summative assessments. By completing and engaging with token activities students can earn 1 to 2 feedback tokens which can be exchanged for deeper levels of feedback in formative assessments. For 0 tokens a student would receive a basic level of feedback, this includes one-word verbs like "expand" or "clarify". 1 token would buy a student more detailed feedback like "expand on this specific concept, idea, or argument" or "clarify this specific word and what you mean here". Lastly, 2 tokens would buy a student the deepest level of feedback with more detail like "expand on this specific concept by referring to these ideas and arguments" or "clarify this word by explaining how it relates to your study". The token activities and formative assessments are scaffolded in such a way to ensure that a student is prepared for completing and submitting the summative assessment. In the summative assessment feedback tokens cannot be earned or exchanged. Figure 2 illustrates the structure and logic of the designed artefact.

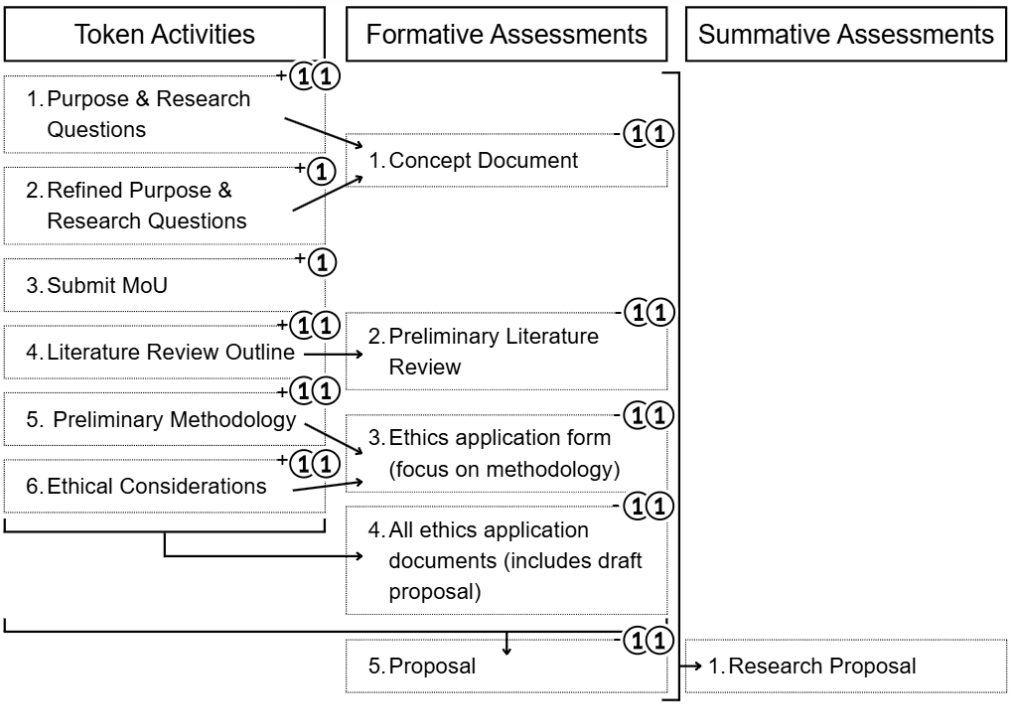

Fig. 2 The Designed Artefact

In Figure 2 the six token activities are listed first, each of these activities required the students to engage with a part of the research process. For activities 1, 4, 5, and 6 the students had to post their ideas on a discussion board and be ready to discuss and explain it in class. A post on the discussion board earned them 1 feedback token and if they also discussed it in class they received another token. Thus, for these activities there were 8 tokens available. It is necessary to note that a student needs to post on the discussion board first before they can view other's posts. For token activity 2 students had to refine their purpose and research questions in token activity 1 to receive 1 feedback token, this was specifically done to allocate supervisors. The first time a student develops a purpose and research questions it generally needs a lot of work, thus by having them post on a discussion board, discuss in class, receive verbal feedback and hear other student's ideas they would be able to better refine their ideas for token activity 2. Token activity 3 was the submission of the signed memorandum of understanding between the student and their supervisor for 1 feedback token. Token activities 1 and 2 were the prior experience to formative assessment 1, the concept document. A student would have been able to earn a total of 3 feedback tokens before submitting formative assessment 1 that would cost them 2 tokens for the deepest level of feedback. Token activity 4 directly related to formative assessment 2, the literature review. For the token activity students had to post their literature review outline on a discussion board for 1 token and then discuss it in class for informal verbal feedback and another token. If students earned and spent the most tokens possible, they would have 4 tokens of which they can exchange 2 for deeper feedback in the preliminary literature review. Token activities 5 and 6 could earn a student 2 tokens each and was the experience that built towards completing the ethical clearance application. For the token activities students had to refine their methodology and ethical considerations. At this point if students completed all activities and spent the most tokens possible, they should have 6 tokens which they can spend on formatives 3, 4, and 5, 2 tokens per assessment for the deepest level of feedback. For feedback assessment 4 students were required to submit all the documents required for ethical clearance which included a draft proposal meaning that all the token activities built towards them being able to complete the required documentation for ethical clearance. Lastly formative assessment 5 is an opportunity for students to buy deeper levels of feedback on their proposal before they submit it for the summative assessment, all the token activities and formative assessments were experiences geared to the students being able to successfully complete their proposal.

7.3 Reflective Insights from the Study

The reflective insights highlighted below can be divided into token management, lecturer perspective, the artefact design, expert insights, and further refinement.

Firstly, token management, initially this was a concern because one does not want to unnecessarily increase admin load. Initially while marking the formative assessments the lecturer had to figure out which tabs and windows were necessary, this was something that one needed to get use to but after a few repetitions she was more comfortable. Remembering to award the tokens was a challenge sometimes but this could easily be circumvented by marking while students discuss in class. Lastly awarding and exchanging tokens within the LMS was beneficial. External systems might add more features but having to work on two systems is not worth it.

Concerning the lecturer perspective there was an assumption that verbal feedback provided during the token activities would mean less feedback in formative assessments, this was not necessarily true. For the students that exchanged the maximum number of tokens providing timeously in-depth feedback was still required but the lecturer gave this gladly as the students were engaging in the classroom. On the other end time was saved during marking for the students who did not exchange tokens for deeper levels of feedback. Furthermore, some students were excited about earning and exchanging tokens which shifted the idea that feedback is something that one will simply receive if work is submitted to feedback requires engagement, is valuable and something one needs to work for.

Regarding general reflective insights of the artefact design, it worked well in the research module where there was one summative assessment at the end of the semester, and all other assessments build towards it. This could mean that it is easily transferable to modules where assessments work in a similar way. Figure 3 illustrates the structure designed and developed in this study.

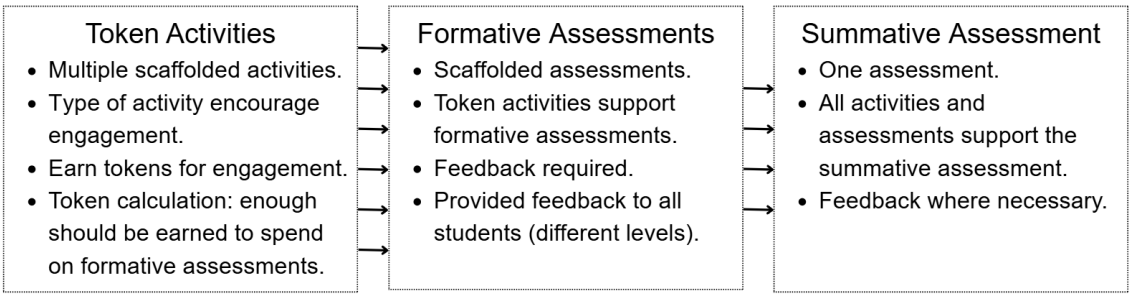

Fig. 3 Structure Gamifying Feedback in Research Modules

Figure 3 illustrates the elements to gamify feedback in research modules which could potentially be adapted to other modules where assessments require iteration and feedback that builds towards a final summative assessment. Important elements to note in Figure 3 is that token activities should be scaffolded, support and build towards the formative assessments, require some form of engagement from the student, and one should calculate the total tokens possible before formative assessments to ensure that students would have enough to exchange it for the deepest level of feedback. For formative assessments the important characteristic is that feedback is required. All students should receive feedback; the depth is dependent on the number of tokens they spend. These assessments should also be scaffolded and build towards the summative assessment. Through this structure a high value is assigned to the human element, lecturer feedback and peer interaction, in the research process. Upon reflection from the implementers perspective this is an interesting idea for further exploration in the age of AI. Many technologies could be used for students to earn tokens and gamify feedback but the idea that they must participate and engage in person to be able to exchange tokens for human, lecturer, time and attention shifts the focus to the importance of the human element. The student must engage to gain access to in-depth feedback from the lecturer.

Furthermore, the experts provided valuable insights of which some were included in the artefact design and others recommended for further development. Their discussions assisted in refining activity expectations and structure as well as motivating a more aesthetically pleasing artefact. Unfortunately, some discussions could only take place during the first implementation which meant that not all expert feedback was implemented as to not confuse students. Suggestions that are recommended for refinement include restructuring feedback types by adding more options and providing students the opportunity to select how they would want to receive the feedback.

Final thought post-implementation reflection to be considered for further refinement. Students started negotiating if they did not have enough tokens for in-depth feedback which leaves room for additional tasks to earn more tokens. Initial ideas regarding this include auto assessed quizzes, peer assessment, and presenting concepts in class. One could also consider the possibility of users gifting rewards to one another, but calculations to ensure viability would be vital before implementing. Students also asked about what happens if they have tokens left at the end of the semester whether they could exchange it for more feedback. This component needs further refinement and could possibly include one-on-one in-person consultation with the lecturer. Which would again assign more value to human interaction.

8. Conclusion

Through the process of DBR and using EL and Gamification principles an artefact to gamify feedback in research modules was developed. This paper described the research process followed and the structural design that was developed. From a practical perspective this study yielded an artefact that is stable and could be used for formal implementation, testing, and measurement. Further research recommendations include exploring lecturer and student perceptions and experiences, and measuring the impact on engagement and academic performance. From a more philosophical perspective this study brought about the idea to find ways to assign value to the human element in the learning process. In this specific study it was rewarding students with tokens for their engagement in a module and then exchanging this reward for access to the lecturer's time, knowledge and expertise. In our current day and age lecturers compete for students' attention and engagement against many forms of media and AI, and this artefact might be a step in the right direction by assigning tangible value to human interaction and engagement.

REFERENCES

[1] M. Li, S. Ma, and Y. Shi, “Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: a meta-analysis,” 2023, *Frontiers Media SA*. doi: 10.3389/fpsyg.2023.1253549.

[2] Y. Tomaylla-Quispe, O. Gutierrez-Aguilar, and S. Chicana-Huanca, “Gamification in Higher Education: A PRISMA-Based Systematic Review of Motivation and Engagement Outcomes,” *Asian Journal of Interdisciplinary Research*, vol. 9, no. 1, pp. 219–232, 2026, doi: 10.54392/ajir26114.

[3] K. Vieno, K. A. Rogers, and N. Campbell, “Broadening the Definition of ‘Research Skills’ to Enhance Students’ Competence across Undergraduate and Master’s Programs,” *Educ. Sci. (Basel).*, vol. 12, 2022, doi: 10.3390/educsci12100642.

[4] O. Kolade, A. Owoseni, and A. Egbetokun, “Is AI changing learning and assessment as we know it? Evidence from a ChatGPT experiment and a conceptual framework,” *Heliyon*, vol. 10, no. 4, 2024, doi: 10.1016/j.heliyon.2024.e25953.

[5] F. Wang and M. J. Hannafin, “Design-Based Research and Technology-Enhanced Learning Environments,” *Educational Technology Research Development*, vol. 53, no. 4, pp. 5–23, 2005, Accessed: Apr. 11, 2026. [Online]. Available: http://www.jstor.org/stable/30221206

[6] S. Mckenney and T. C. Reeves, “Methods of evaluation and reflection in design research + Positioning evaluation and reflection in a larger process,” *Zeitschrift für Berufs-- und Wirtschaftspädagogiek*, vol. 27, pp. 141–153, 2014.

[7] C. Hoadley and F. C. Campos, “Design-based research: What it is and why it matters to studying online learning,” *Educ. Psychol.*, vol. 57, no. 3, pp. 207–220, 2022, doi: 10.1080/00461520.2022.2079128.

[8] S. Mckenney and T. Reeves, “Design-Based Research,” in *The SAGE Encyclopedia of Educational Technology*, J. M. Spector, Ed., SAGE Publications, Inc., 2015, pp. 189–191. doi: 10.4135/9781483346397.n83.

[9] E. Tagarda, D. Ray, and B. Mahinay, “Applying John Dewey’s Experiential Learning and Pragmatism in Contemporary Education,” in *Educational Philosophies in the Contemporary Philippine Context*, 2025, ch. Chapter 8, pp. 81–93.

[10] D. T. M. Linh, “Applying John Dewey’s Experiential Learning Model to Organize Life Skills Education Activities for Elementary School Students,” *European Journal of Theoretical and Applied Sciences*, vol. 2, no. 4, pp. 760–769, 2024, doi: 10.59324/ejtas.2024.2(4).65.

[11] J. Dewey, *Experience and Education*, 19th Print. New York: The Collier Books Macmillan Publishing Co, 1976.

[12] T. G. Roberts, “An Interpretation of Dewey’s Experiential Learning Theory.,” 2003, *ERIC*. Accessed: Jan. 12, 2026. [Online]. Available: https://eric.ed.gov/?id=ED481922

[13] Y. Kong, “The Role of Experiential Learning on Students’ Motivation and Classroom Engagement,” *Front. Psychol.*, vol. 12, p. 771272, 2021, doi: 10.3389/fpsyg.2021.771272.

[14] N. Anuradhani, K. Yatigammana, and G. Wijayarathna, “Defining gamification: a systematic literature review for developing a process-oriented definition,” *Journal of Multidisciplinary & Translational Research*, vol. 9, no. 1, pp. 66–85, 2024, doi: 10.4038/jmtr.v9i1.6.

[15] A. Christopoulos and S. Mystakidis, “Gamification in Education,” *Encyclopedia*, vol. 3, pp. 1223–1243, 2023, doi: 10.3390/encyclopedia3040089.

[16] B. Mirzaie Abadi Feiz, N. Khalili Samani, A. Akhlaghi, S. Najibi, and M. Bolourian, “Pros and Cons of Tomorrow’s Learning: A Review of Literature of Gamification in Education Context,” *Medical Education Bulletin*, vol. 3, no. 4, pp. 543–554, 2022, doi: 10.22034/meb.2022.350941.1063.

[17] S. A. Triantafyllou, C. Georgiadis, and T. Sapounidis, “Gamification in education and training: A literature review,” *International Review of Education*, vol. 71, pp. 483–517, 2025, doi: 10.1007/s11159-024-10111-8.