Play with Purpose: A Heuristic Approach to Evaluating Tabletop Serious Games for Academic Integrity Education

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Abstract: This article introduces a heuristic evaluation of CiteSaga, a tabletop serious game designed to enhance skills in referencing and citation, crucial for academic writing in higher education. We detail the application and outcomes of a novel heuristic evaluation framework tailored for tabletop serious games, dubbed "Play with Purpose." This framework is distinguished by its focus on eight essential categories: Learning Experience, Utility, Game Features, Social Dynamics, Adaptability, Learning and Feedback, Play Experience, and Accessibility, marking a significant contribution to the evaluation of non-digital game-based learning tools. Furthermore, we delve into the insights gained from participatory design sessions with students, aimed at evaluating CiteSaga's component appeal and game mechanics. The paper culminates in a discussion on how student feedback has informed subsequent iterations of CiteSaga, underscoring the critical role of heuristic evaluations in refining game-based learning experiences. Our findings not only advance understanding of empirical evaluation methodologies for tabletop serious games but also provide a valuable framework for future research and development in educational game design.

Keywords: Heuristic Evaluation, Game Design, Tabletop Serious Games, Academic Integrity

1. Background

The tabletop gaming industry has grown in the recent past due to advancement in technology and changes in consumers' preferences. This sector includes board games, card games, role-playing games, and digital-tabletop games, which are intermeshed with physical games, and target different groups of consumers (Thammavongsy et al. , 2020; Bolesnikov et al. , 2022). Tablet games are popular due to their ability to create social interaction and co-operative gameplay with new technologies such as augmented reality improving the game play and the convenience (Yuan et al. , 2021; Koukia, 2018; Thévin et al. , 2021). These games have spread their audience beyond the typical gamers, and such institutions as schools, libraries, and even psychologists pay attention to them. They are now employed in the teaching of different disciplines and have been crafted to accommodate different groups of people including the elder people as well as the visually impaired persons (Triboni & Weber, 2018; Bolesnikov et al. , 2022).

Thus, such an interest in the application of SGs in educational environments has required a proper assessment of their impact on learning. Heuristic evaluations involve the assessment of the usability, accessibility, and general usability of SGs, with a view of determining the areas that require some changes and confirming its compliance with the educational objectives (Desurvire et al. , 2004; DiNardo & Broussard, 2019; Slyman et al. , 2022). Both these assessments employ principles to assess the interface, interaction design and gameplay experience hence helping the educators and developers to improve the educational value of SGs and to foster the learning achievement.

2. What are Tabletop Serious Games, Anyway?

Tabletop serious games are defined as the interactive games which are meant for achieving certain educational, training, or persuasive goals beyond the realm of entertainment (Noda et al. , 2019). These SGs are mainly done on a flat surface as physical board or card games and give a real feel and touch of board and cards to the players which makes the player involve in the game more effectively and increase the level of team work, participation and interaction (Bonnechère et al. , 2016). They usually incorporate physical objects and multimodal tools to create engaging educational situations to support learner-centered approaches and establish positive learning contexts (Zhang et al. , 2021). Furthermore, tabletop SGs enhance the physical interpersonal relationships and social interactions and are thus ideal for use in learning and entertainment settings (Mccallum & Boletsis, 2013). Designing these games is focused on the principles of usability and accessibility which make the games appealing and beneficial to many users (Abbott, 2019).

The CiteSaga concept implemented at the North-West University's Library is a good example of how the students' engagement and the academic integrity can be promoted within the higher learning institutions. As a result of understanding the difficulties that students encounter in the correct citation and referencing styles, CiteSaga has come up with an interactive way of teaching students these important academic skills through the use of games. This way, the initiative strengthens the concept of academic integrity since the various tasks involve the correct use of citations. Also, CiteSaga enables group learning and peer to peer interaction where students are able to solve citation problems and share great experiences. This social dimension is important in helping students to foster their interpersonal skills through collaborative and group work to identify the most appropriate method of referencing thereby improving on their knowledge and performance.

3. The Purpose of This Research

Traditional academic integrity education is usually done in writing courses, research tutorials or workshops where students are taught about citation laws in order to avoid plagiarism (Obeso, 2023; Ramdhany, 2023). Citation management tools and bibliographic instruction help the students to reference the sources used in the right manner; however, many students fail to use citations in the right way thereby limiting their engagement in academic discourse (Iskandar & Patak, 2019; Okeji et al. , 2020). These conventional techniques fail to capture the various citation formats thus creating mistakes that affect the quality of the work (Romanowski, 2022). Citation instruction is only offered in the first and the third year at North-West University, which means that there is a necessity to find new ways to enhance the students' citation skills and promote academic integrity through the usage of serious games (SGs).

The focus of this paper is to describe the heuristic evaluation of CiteSaga, a serious game in the context of citation and reference styles at a South African university. The research involved the students in the design of the game, and their feedback concerning the usability, accessibility of the game and the extent to which it helped in improving citation skills and academic integrity. The purpose of the study was to confirm that the game is useful to students, make suggestions for the game design and assess how the game affects students' ethical decision making and academic integrity (Ifenthaler & Yau, 2020).

4. Literature Review

4.1 Serious Games and Their Potential for Education

This paper also analyze several literatures on the application of serious games (SGs) in the educational context. Educational value of SGs was discussed by Breuer & Bente (2010) whereas Khaled & Vasalou (2014) explained the significance of participatory design in learning through domain expertise. Medema et al. (2016) explained how SGs promote social learning and stakeholder participation in environmental management and Ampatzidou & Gugerell (2018) explained the aspect of having content in SGs while making them fun. Verschueren et al. (2019) proved that SGs can be effective in the management of psychological and health problems in children. Furthermore, Sharifzadeh et al. (2020) also identified that SGs are useful in health education and Hainey et al. (2022) also showed that SGs are helpful in formative assessment. The effectiveness of SGs was demonstrated in the real world by Putra et al. (2022) through an example of a COVID-19 social distancing game. Altogether, these studies point to the potential of SGs for use in educational and health-related settings.

4.2 Heuristic Methods for Evaluating Serious Games

These studies collectively highlight the significance of heuristic methods in evaluating the accessibility, feasibility, and effectiveness of serious games (SGs) across various domains: All these works in combination depict the role of heuristic approaches in evaluating the applicability and effectiveness of serious games (SGs) in various fields:

1. Tong et al. (2016) have described how SGs can be utilized for identification of cognitive impairments in the healthcare setting which makes it possible to apply the presented cognitive screening in the clinical practice.
2. Lau et al. , (2017) also did a systematic review and meta-analysis of SGs and they also concluded that SGs have a moderate effect in the reduction of symptoms of mental health disorders is vital since SGs are easily accessible and useful.

3. As stated by Ghoman et al. (2019), neonatal HC professionals are trained by SGs; the best way for this is through board and computer-based games which are also the most effective method of knowledge enhancement.
4. Salvador-Ullauri et al. , (2020) described the SGs design as non-inclusive because the designed SGs are not for everybody and called for inclusive design in the SGs.
5. Olgers et al. (2021) stated that SGs are useful in improving skills in medicine, though more studies need to be done so as to determine if they are efficient as well as accessible.

Table 1: Overview of Methodologies and Key Elements in Serious Game Research

Reference	Methodology	Key Elements
Bellotti *et al.* (2010)	Effective Serious Games Design	Cognitive aspects, theoretical foundations
Yoon & Park (2013)	Quality Evaluation Standard	9 main elements and 31 sub-elements
Kato (2010)	Serious Game Evaluation	Interactivity, Learning, Scoring, Scenario, Enthusiasm, User's traces
Hannig *et al.* (2012)	Collaborative Serious Game, Web-Based Collaborative Serious Game	Stimulation of conceptual thinking, Optimal design of a medical practice
Roungas (2016)	Model-driven Framework, Model-Driven Framework	Educational and entertainment game elements (twice listed)
Gordon *et al.* (2016)	Heuristic Evaluation	User Interface (UI), User Experience (UX), Serious immersive games and M-instruction
Lameras *et al.* (2016)	Serious Games Design, Linking Learning Attributes to Game Mechanics	Learning attributes and game mechanics
Salvador-Ullauri *et al.* (2020)	Accessibility Evaluation, Heuristic Evaluation	Heuristic method for evaluating accessibility, Accessibility in serious games, Accessibility issues, usability, effectiveness
Couret *et al.* (2020)	Risk-taking Behaviour Modelling, Operationalization, Heuristics evaluation strategy	Operationalisation of the availability heuristic, Avalanche accident victims, availability heuristic, Mobile game-based learning

Table 1 captures the methodologies and focal shifts in SG studies, illustrating the evolution from foundational theories to practical applications. Starting with Bellotti *et al.* (2010), it traces the development of cognitive frameworks and theoretical underpinnings in SGs, moving towards the critical evaluation of game effectiveness and educational utility through interactivity and user engagement, as emphasised by Yoon & Park (2013) and Kato (2010). It further explores the application of SGs in educational and other settings through collaborative and model-driven frameworks discussed by Hannig *et al.* (2012) and Roungas (2016). Notably, Gordon *et al.* (2016) highlight the importance of usability, focusing on user interface and experience, while Salvador-Ullauri et al. (2020) and Couret *et al.* (2020) reflect ongoing advancements in accessibility and heuristic evaluations, underscoring the increasing emphasis on making SGs both accessible and instructional.

Table 2: Heuristic Evaluation Elements in Serious Game Research

Reference	Heuristic Evaluation Elements
Desurvire *et al.* (2004)	Playability, game mechanics, aesthetics, user experience
Desurvire & Wiberg (2009)	Game usability, design, better games
Gordon *et al.* (2016)	User Interface (UI), User Experience (UX), software reflection
Hermawati & Lawson (2016)	Domain-specific heuristics, identification of specific issues, consensus on domain-specific heuristics
Tondello *et al.* (2016)	Motivational affordances, gameful design, usability
Yáñez-Gómez *et al.* (2018)	Mobility, multiplayer interactions, enjoyability, playability
Ishaq *et al.* (2021)	Usability, playability, game-based language learning
Lima *et al.* (2022)	Content validity, Cronbach's alpha, heuristics
Muhanna *et al.* (2022)	Usability, playability, Arabic mobile games
Slyman *et al.* (2022)	Learning elements, usability, design
Paneva-Marinova & Pavlov (2018)	Student motivation, learning, curiosity, skill development
Zaibon & Shiratuddin (2010)	Applicability, modular playability heuristics, health-enhancing games
Suhonen & Väätäjä (2010)	Core game elements, usability, health-enhancing games

Table 2 explores heuristic evaluation elements in SG research, detailing the evolution of criteria used to assess their usability and effectiveness. It starts with the foundational contributions of Desurvire *et al.* (2004) and

Desurvire & Wiberg (2009), who emphasise playability, game mechanics, and user experience, key to engaging and educational games. The field has since seen the development of more specialized heuristics, such as those by Hermawati & Lawson (2016) and Tondello *et al.* (2016), focusing on domain-specific issues and motivational affordances, indicating a shift towards more nuanced evaluation strategies. Recent research, including studies by Ishaq *et al*. (2021) and Lima *et al*. (2022), continues to refine these criteria, aligning them with specific educational goals and broader learning scenarios, while researchers like Lee & Lee (2021) expand the definition and applications of SGs by incorporating narrative and multimedia elements.

Table 3: Specific approaches and methodologies for conducting heuristic evaluations of SGs

Approach	Description
The Fuzzy Analytic Hierarchy Process (FAHP)	A technique employed to assess SGs, specifically in educational settings. This approach involves the use of fuzzy logic to prioritise and evaluate various dimensions of SG, including pedagogical, technological, ludic, and behavioural aspects (Omari *et al.,* 2020).
Participatory Game Prototyping	Involving stakeholders, such as students and educators, in the process of designing and developing SGs. This approach prioritises significant player involvement and the integration of local context, guaranteeing that the game design is in line with educational goals and user preferences (Desurvire *et al.,* 2004).
Usability Heuristics	A systematic method for assessing serious games, specifically in the realm of mobile games. This approach entails the creation and implementation of usability heuristics specifically designed for assessing serious games, guaranteeing that the games adhere to usability and playability criteria (Soomro & Ahmad, 2014 and Muhanna *et al.,* 2022).
Serious Game Evaluation Framework	A methodology to evaluate the efficacy and educational value of SGs. This approach prioritises the evaluation of SGs by considering their theoretical, technical, empirical, and external aspects, thus ensuring a comprehensive assessment (Wilson *et al.,* 2016).
Heuristic Evaluation to Assess Immersive Games	This approach expands the application of heuristic evaluation to encompass complex immersive games and mobile instructional platforms. The process entails the use of established heuristic evaluation techniques to evaluate the usability and educational value of SGs, specifically in immersive and mobile settings (Gordon *et al.,* 2016).

Table 3 shows the variety and depth of heuristic assessment methods for SGs. Omari *et al.* (2020) analyse SGs using fuzzy logic to assess pedagogical, technical, ludic, and behavioural characteristics using the Fuzzy Analytic Hierarchy Process (FAHP). Participatory Game Prototyping involves students and educators in SG design to correspond with educational aims and user preferences, according to Desurvire *et al.* (2004). SGs, especially mobile games, need usability heuristics to ensure usability and playability, according to Soomro & Ahmad (2014) and Muhanna *et al*. (2022). Wilson *et al.* (2016) evaluate SGs theoretically, technically, empirically, and externally using the Serious Game Evaluation Framework. Finally, Gordon *et al*. (2016) applied heuristic assessments to sophisticated immersive games and mobile teaching platforms, focussing on usability and educational value. This table describes the methods used to improve and evaluate SGs across dimensions and platforms.

Evaluating SG heuristics involves not only the game's functionality and playability, but also its ability to effectively communicate its educational or training content. Below are several frequently assessed heuristics for both digital and analogue SGs. **Heuristics applicable to tabletop SGs are marked with a ✅ symbol:*

- Educational Value ✅ : Assess the game's efficacy in achieving its educational goals, encompassing the acquisition of knowledge and the development of skills.
- Engagement ✅ : Evaluate the game's ability to effectively captivate and sustain players' attention.
- Usability ✅ : Evaluate the user-friendliness of the game, encompassing factors such as the design of the user interface, ease of navigation, and the clarity of instructions and feedback.
- Accessibility ✅ : Assess the game's capacity to be utilised by individuals with varying abilities, including those with disabilities.
- Responsiveness ✅ : Assess the effectiveness in delivering informative responses to the player and modifying its difficulty level to enhance the process of learning and participation.
- Narrative ✅ : Evaluate the efficacy of the storyline or narrative in augmenting learning by offering context and significance to the game's goals.
- Interactivity ✅ : Evaluate the extent and quality of the interaction(s) within the game, encompassing the level of control given to the player and the game's ability to promptly respond to the player's actions.
- Learning Analytics ⚠ : Analyse the methods the game employs to measure the player's progress and advancement towards the game's educational goals.

- Social Interactions ✅ : Assess the extent to which a game promotes cooperation, competition, and communication among players in games that have multiplayer features.
- Fidelity ⚠ : Evaluate the degree to which the game faithfully replicates real-life situations—a crucial aspect for training and simulation games.
- Flexibility ⚠ : Assess the game's capacity to be expanded or modified to suit various situations, player counts, or degrees of difficulty.Ethical and Cultural Sensitivity ✅ : Evaluate the degree to which the game demonstrates respect for cultural uniqueness and whether or not it refrains from endorsing detrimental stereotypes or biases.

The selection of these heuristics may differ depending on the particular goals and intended audience of the serious game. They are frequently employed in conjunction with conventional game design principles to ensure that the game is both efficacious in achieving its serious objectives and captivating as a game.

5. Research Strategy

The “Play with Purpose” model (Figure 1) is a comprehensive model for analyzing serious games, especially tabletop games such as CiteSaga, on different aspects of Accessibility, Utility, Learning Experience, and Social Dynamics. Therefore, these aspects make the game easy to play by any person, the rules of the game are well defined, players are able to learn easily through the game and the game fosters social interaction. Other factors like Play Experience, Feedback, Adaptability and game Features are added to the evaluation process which is consistent with literature on pedagogical affordances of serious games.

In this study, this framework informed a survey completed among education and economics students at a South African university to assess CiteSaga. Thus, despite the limited number of participants and the alpha-phase of the game, the present study was able to offer a focused analysis of the game’s design and educational potential. Subsequent larger scale testing on more universities will determine the validity of CiteSaga in more universities and improve on the current glitches to make it more versatile.

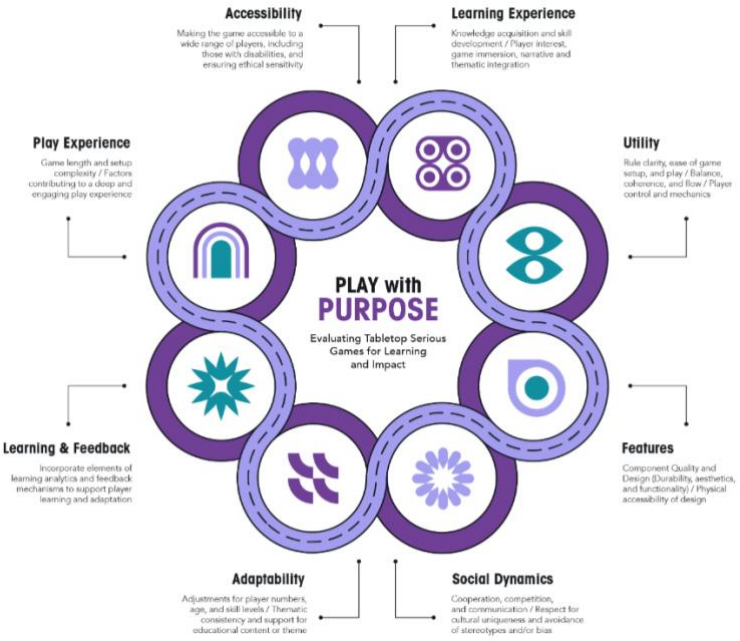


Figure 1: Play With Purpose framework for tabletop serious game evaluation (Source: Own conceptualisation)

5.1 Framing “Play With Purpose”

In the evaluation of the tabletop SG *CiteSaga* using the "Play with Purpose" (PWP) framework, the study strategically focused on four specific elements of the heuristic wheel: Learning Experience, Features, Play Experience, and Learning & Feedback. This targeted approach was designed to provide a solid empirical foundation for these aspects prior to more interactive play sessions with students. The following sections explain how this strategic focus integrates into the broader discussion of the game's development and future testing.

5.1.1 Strategic Focus on Selected PWP Elements

The choice to limit the initial empirical evaluation to Learning Experience, Features, Play Experience, and Learning & Feedback allowed for a concentrated analysis of these critical areas. Each of these dimensions plays a vital role in the overall educational effectiveness of the game:

- Learning Experience: By assessing how well the game facilitates knowledge acquisition and skill development, the study ensures that the main educational goals of *CiteSaga* are being met.
- Features: Evaluating the quality and design of the game components provides insights into the physical and aesthetic appeal of the game, which are crucial to maintaining engagement.
- Play Experience: Focusing on game length and setup complexity helped determine whether the game's structure was conducive to deep and engaging gameplay, which is essential for sustained interaction and learning.
- Learning & Feedback: This dimension was critical to assess how effectively the game incorporates feedback mechanisms and learning analytics, supporting adaptive learning and ongoing player development.

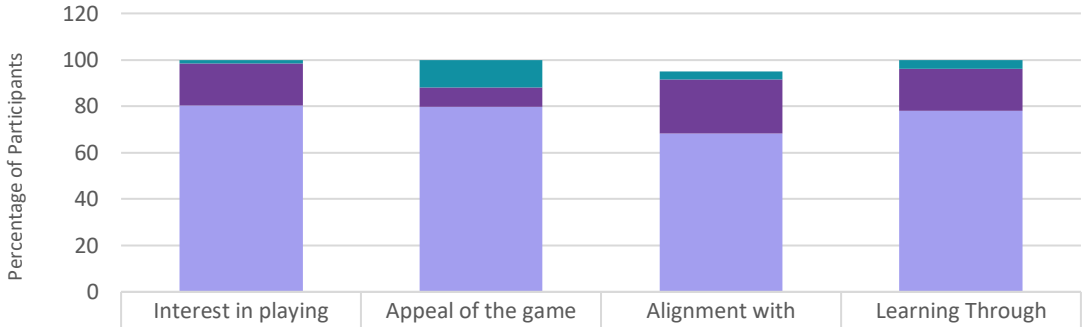
5.1.2 Future Testing of Remaining Elements

The remaining four elements of the PWP framework—Accessibility, Utility, Adaptability, and Social Dynamics—were not empirically tested in the initial phase reported here. The rationale for this was to allow these dimensions to be explored during actual play sessions with students. This approach aims to observe and measure these aspects in a dynamic, interactive environment where real-time data and feedback can provide a more genuine and comprehensive assessment.

- Accessibility: Future sessions will specifically look at how the game accommodates diverse player needs, including those with disabilities.
- Utility: Observations will focus on the game's rules, balance, and flow during play to assess its practical utility and ease of understanding in a live setting.
- Adaptability: Testing will evaluate the flexibility across different player demographics, skill levels, and group sizes of players.
- Social Dynamics: This will involve evaluating how the game fosters interaction among players, including aspects of cooperation, competition, and communication.

6. Findings and Recommendations

The survey received 151 responses over the course of a two-week period. Figure 2 highlights the positive reception of *CiteSaga* among participants, with convincing interest, appeal, and perceived educational value. Such insights are crucial for refining the game and enhancing its effectiveness as a learning tool. The data, moreover, suggests that *CiteSaga* has the potential to significantly impact students' understanding and application of citation styles and academic integrity practices.



	Interest in playing the game	Appeal of the game experience	Alignment with university experience	Learning Through Playing
No	1.72	12.02	3.43	3.86
Maybe	18.03	8.15	23.18	18.03
Yes	80.26	79.83	68.24	78.11

Figure 2: Reception of various elements of the *CiteSaga* game concept.

The results reveal a strong positive reception of *CiteSaga* among research participants. A significant majority (80.26%) expressed interest in playing *CiteSaga*, indicating a strong initial engagement with the game concept. Furthermore, 79.83% affirmed the appeal of the game experience, suggesting that the design and concept resonate well with the target audience. In terms of educational alignment, 68.24% of participants agreed that *CiteSaga's* objectives align with their university experience regarding the need to reference sources correctly, with another 23.18% somewhat agreeing. This demonstrates the effectiveness in addressing relevant academic integrity skills. Furthermore, 78.11% of the respondents believed that they would learn more about citation styles and academic integrity by playing *CiteSaga*, highlighting its potential as an edifying tool. The data also reveals areas for potential improvement, as 18.03% were uncertain about the game's appeal and educational value, and a small fraction (3.86%) did not think they would learn more, suggesting opportunities for enhancing engagement strategies.

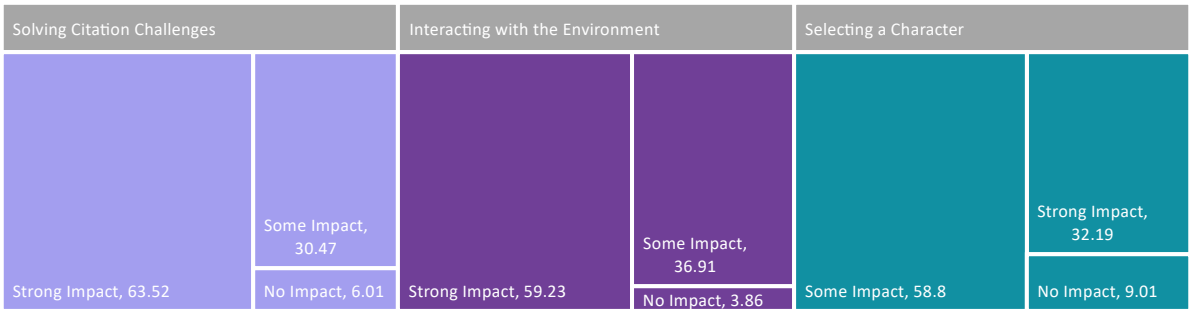


Figure 3: Reportage of various *CiteSaga* mechanics and their perceived impact on learning

The stages of gameplay in *CiteSaga* vary in their level of appeal. The most attractive aspect was the solution of citation challenges, which accounted for 26.45% of the overall experience. This was followed by interaction with the various environment cards at 21.76% and selecting a character at 20.66%. Understanding these preferences is crucial to optimising the design to improve player engagement and outcomes. The impact of these gameplay elements on learning is also significant. Solving citation challenges had the strongest impact, with 63.52% of participants indicating it as highly impactful, followed by interacting with the environment (59.23% strong impact) and selecting a character (32.19% strong impact). In terms of ease of the learning, 72.96% of participants found the *CiteSaga* game mechanics relatively straightforward to learn, while 13.30% found them extremely easy. However, a minority of participants (13.73%) encountered difficulties with the mechanics, indicating a need to streamline or clarify the game rules.

6.1 Learning Experience

The assessment of CiteSaga with regards to educational impact centred on the learning that it offered to the students. The survey questions (Q1-Q25) were about the level of participation, understanding of the learning objectives and the application of the in-game scenarios. As seen, relevance of content, goals, and learning as integral parts of the games were mentioned by the respondents, in accordance with the theory of good educational games (Gee, 2003; Plass, Homer, & Kimzer, 2015). Customer feedback pointed to the following primary goals of the game; citation (60%), integration (25%) and interactive learning (15%). However, some of the feedback feedback indicated that educational content should be integrated more deeply which is a problem recognised by Annetta (2010). Thus, the majority of respondents were inclined to think that playing CiteSaga would improve their knowledge about citation styles and academic integrity and thus recognized the potential of the game as a proper learning tool.

6.2 Features

Questions Q26-Q30 was related to the physical and aesthetic features of CiteSaga with regards to customizations (45%), gameplay (35%), and hardware (20%). Research-backed customisation and narrative-based engagement influence the level of player's commitment and willingness to replay the game (Salen & Zimmerman, 2004; Habgood & Ainsworth, 2011). The aspects which were important for 60% of students were high-quality components while 40% of students mentioned the character customization, which is in harmony with Adams (2014), who pointed out the significance of the esthetic aspects for educational games. According to 55% of the respondents, the storyline of the game had to be compelling and 50% said that the environment had to be well

developed, in line with Jenkins (2004) on the need for narrative integration. On the whole, the responses pointed out that CiteSaga is good in component quality and design, the aspects that are crucial to the game's appeal.

6.3 Play Experience

Questions Q31-Q44 asked to explore the participants' pre-play experience of *CiteSaga*, focusing on length of play, setup complexity, and structure of gameplay activities. Key issues were the high percentage of cooperative play (50%) and competitive aspects (30%), and scenario-based challenges (20%) that participants found yielded a high degree of educational value and required engagement. In this sense, the outcomes are consistent with Johnson *et al.* (2011): cooperative gameplay supports the development of collaboration and communication, while elements of competition might be engaging. They also value clear instructions (45%), balanced levels of difficulty (30%), and reward(s) for progression (25%), which were essential to ensure a certain degree of game engagement conducive to educational objectives (Gee, 2003). Character development (40%) and narrative contexts (35%) were also good indicators. The high rate of narrative-driven activities is explained by the fact that gameplay should be a challenge but also manageable, supporting the findings by Barab *et al.* (2009) that narrative contexts in games can promote deeper engagement and learning.

CiteSaga's length and complexity of the setup were seen as contributive factors to the learning experience, suggesting that these aspects provide a deep and engaging play experience as envisioned in the PWP framework.

6.4 Learning and Feedback

Questions Q45-Q49 were aimed at measuring the learning and feedback process applied in CiteSaga. While, 70% of the participants highlighted that they had access to self-assessment opportunities, 30% of them wanted to see some changes. Interestingly, 40% of the students wanted more frequent feedback, 35% wanted detailed explanations, and 25% wanted adaptive learning paths. These findings are in accord with Shute (2008) and Hattie and Timperley (2007) who stressed that feedback has to be formative and timely in order to promote self-regulated learning. The call for adaptive learning relates to literature for the personalized learning experiences (Plass, Homer, & Kinzer, 2015). In general, participants had a moderate to a good understanding of CiteSaga's educational objectives, which points to the effective use of learning and feedback functionalities.

6.5 Recommendations

The recommendations made to improve the *CiteSaga* concept are informed by data collected from the feedback of the respondents. These are presented below:

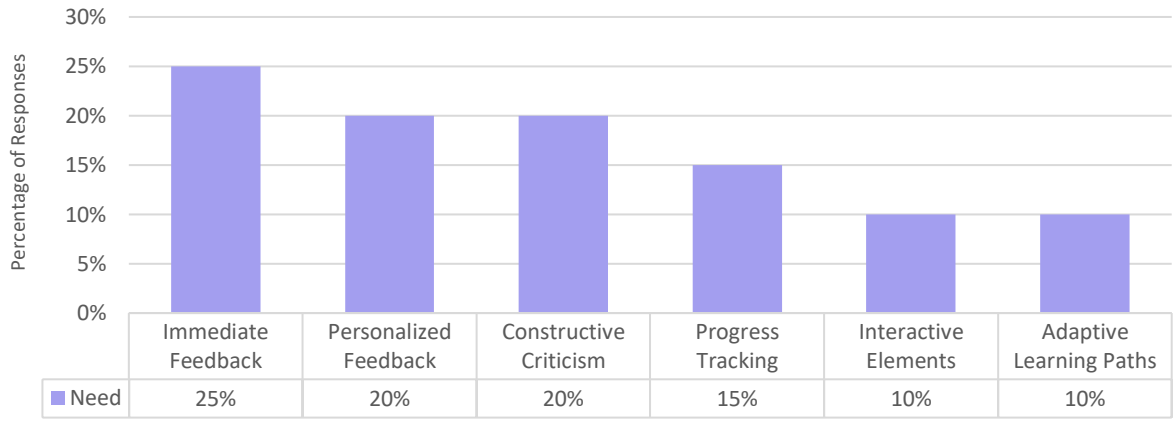


Figure 4: Reportage on the requirements to improve feedback in *CiteSaga*

In Figure 4, the most important aspects that could be enhanced for the learning experience in CiteSaga are stressed. The most important need mentioned by 25% of the participants is feedback which is helpful in learning from the results and correcting mistakes. Other aspects that were considered important included receiving feedback and critiques by 20% of the participants while 15% wanted to have their progress monitored. Also, 10% of the participants pointed to the importance of the interactive features and the opportunity for personalized learning paths. The following suggestions can be made for the improvement of the future iterations of CiteSaga; simplify the instructions, include difficulty levels, provide feedback to the user during the game and

enhance the visual aspect of the game for its accessibility. These changes are intended to improve educational effectiveness as well as levels of user comfort. More statistical analysis can also be conducted to support these findings and provide more information on how CiteSaga can be improved to better cater for different learning requirements.

7. Conclusion

This study addresses the research questions as follows:This study addresses the research questions as follows: *How can the principles of participatory design be included in the development of tabletop serious games for teaching academic integrity and referencing skills?* This information and feedback from the participants in CiteSaga design process was very active, thus it directly informed the changes in game play, story line, and educational content. Notably, 79. Out of all the participants, 83% said that the game was interesting while 69. Out of the total number of respondents 52% were able to demonstrate the knowledge of the education objectives. This feedback supports the use of participatory design in ensuring that the game is in sync with the educational goals and at the same improving on the fun aspect of the game.

Which heuristics are the most suitable in determining the accessibility and usability of educational tabletop serious games? User-based heuristic evaluation revealed the need for easy-to-understand instructions, good graphics, and ease of use. A majority, 72. 16% while 89% of the participants reported that the instructions were clear showing that clear guidelines are important to usability and accessibility. These findings implies that serious game designers should pay much attention to the quality of the visual interface, readability and the clarity of instructions to achieve the intended educational outcomes.

How effective is the design of CiteSaga in promoting academic integrity among the tertiary level of students? The study also showed that 78. 11 % of the respondents reported that they expected to gain more knowledge on citation styles and academic ethics by using CiteSaga. Additionally, 72. Ninety six percent of the respondents believed that the complexity of the game was beneficial to learning and thus the game has incorporated educational content in the right manner to boost academic performance.

In general, CiteSaga was considered to be a good system and participatory design was found to be an important factor in the design process. The integration of design in the material used for the teaching of academic integrity in the tertiary institutions makes it a relevant tool for the same.

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