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Integrating Gamification and Multimedia in Music Theory Learning: Development and Assessment of Note Quest

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Abstract−Learning fundamental music notation can be challenging for beginner learners, particularly when instructional materials lack engagement and interactivity. This study aims to design, develop, and evaluate Note Quest, a gamified mobile learning application that integrates multimedia elements to support independent music theory learning. Guided by the ADDIE instructional design model, the application was developed using Unity and deployed on Android tablets. A two-phase evaluation approach was implemented. First, a formative evaluation involving four experts in multimedia design and music education assessed functionality, navigation, accessibility, interface design, and instructional content. The feedback led to improvements in audio consistency, visual clarity, and gameplay flow. Subsequently, a summative evaluation with 30 beginner music learners was conducted using a structured quantitative survey. Results indicated high usability and learning support, with interface design (M = 4.48) and functionality (M = 4.40) receiving the strongest ratings. Overall, findings demonstrate that Note Quest effectively facilitates music notation learning through engaging digital gameplay. Future enhancements will focus on expanded content, accessibility features, and improved onboarding support to further strengthen its educational value.

Keywords: Gamification; Mobile Learning; Music Theory Education; Multimedia Integration; Usability Evaluation

1. INTRODUCTION

The integration of digital technologies into education has reshaped learning practices, particularly in disciplines involving abstract and symbolic concepts such as music theory and notation. Conventional instructional approaches, which often rely on lectures, drills, and rote memorisation, tend to offer limited interactivity and may reduce learner motivation, especially among beginners who struggle to interpret musical symbols meaningfully. As modern learning environments increasingly emphasise engagement, autonomy, and experiential learning, alternative strategies have emerged, with gamification receiving growing attention.

Gamification refers to the application of game design elements, including rewards, levels, challenges, and progress tracking, in non-game contexts to enhance learner motivation and engagement (Deterding et al., 2021). Prior studies have shown that gamified learning environments can promote perseverance, intrinsic motivation, and active participation (Chu, 2020). This approach is particularly suitable for music notation learning, which requires learners to interpret pitch, rhythm, duration, and structural relationships that are often perceived as cognitively demanding and abstract. Traditional notation instruction typically involves repetitive symbol recognition and memorisation, which, although essential, can feel monotonous and discouraging to novice learners.

Gamification offers a promising alternative by transforming repetitive learning tasks into interactive challenges supported by immediate feedback and a clear sense of progression. Research has demonstrated that game-based music learning environments can enhance motivation, participation, and memory retention (Baah et al., 2023; Cheng et al., 2024). For instance, Chu (2020) reported that students using gamified music theory tools showed improved symbol recognition and greater willingness to practise independently. However, many existing gamified music applications focus primarily on instrumental performance or rhythm training, rather than building a strong foundation in music notation theory. This reveals a gap in both research and practice, particularly for beginner learners who require structured, incremental, and engaging support.

Music notation remains challenging for many beginners due to its abstract nature and the limited availability of engaging instructional tools. Traditional teaching methods often fail to sustain attention, leading to slow progress, reduced confidence, and learner frustration (Carrascosa et al., 2024). Moreover, the absence of real-time feedback in conventional settings can hinder learners' ability to identify and correct errors, negatively affecting motivation and learning outcomes. To address these challenges, interactive learning platforms that integrate game mechanics and continuous feedback are increasingly needed. Gamification has the potential to transform music notation learning into a more enjoyable and rewarding experience, thereby improving engagement, persistence, and retention (Alamri, 2024).

In response to this need, the present study focuses on the design, development, and evaluation of *Note Quest*, an Android-based gamified learning application aimed at improving music notation literacy. The objectives of the study are to design a game-based music notation application, to develop the proposed gamified system, and to evaluate its effectiveness in supporting learners' understanding of music notation. The target users are beginner to intermediate learners with varying levels of prior knowledge. Inclusive design principles are incorporated, including high-contrast visuals, adjustable font sizes, and simplified navigation, to support diverse learners with different learning needs (Yussop et al., 2019). The instructional content is structured progressively, beginning with basic note recognition and advancing to more complex concepts, while gamified elements such as rewards, levels, and instant feedback are guided by motivational theories to support sustained engagement and learning.

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2. RESEARCH METHODS

The development and evaluation of Note Quest followed the ADDIE instructional design model: Analysis, Design, Development, Implementation, and Evaluation (Figure 1). This model ensured that the application was aligned with clear learning objectives, user needs, and continuous feedback. Formative evaluations with experts guided iterative improvements, while the summative evaluation focused on end-user experience and learning support using the final version of the app.

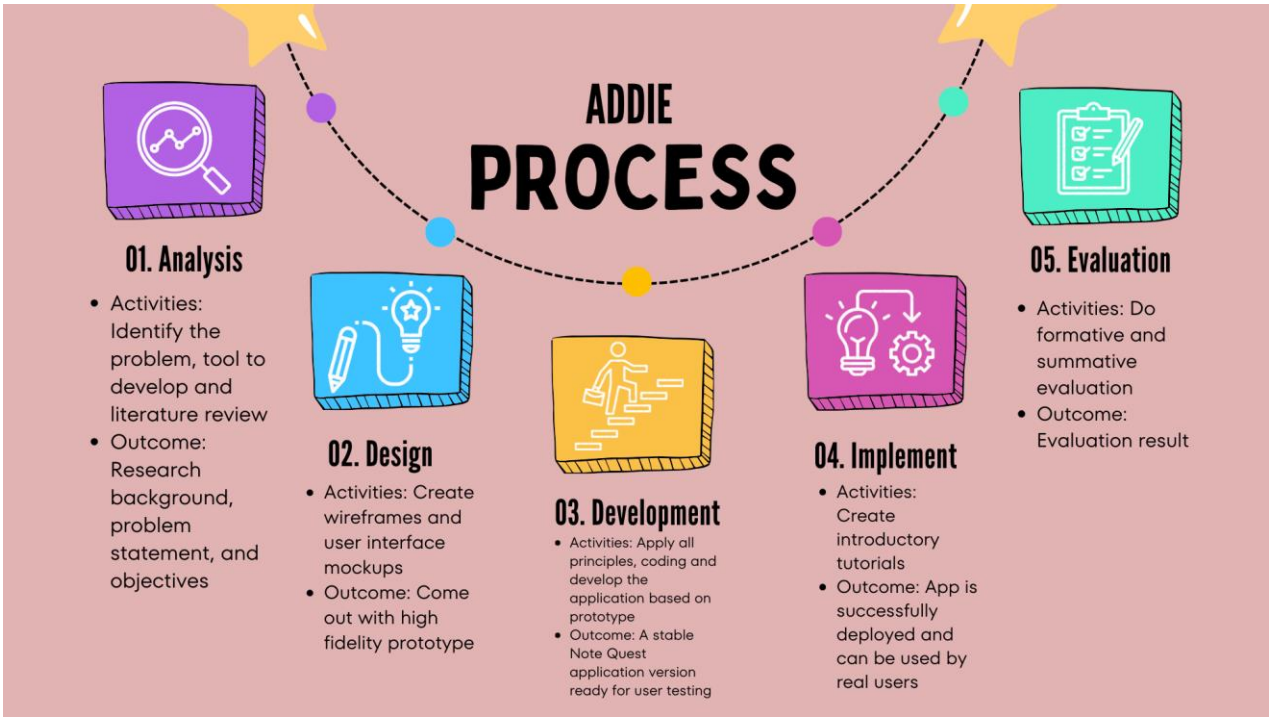

Figure 1. ADDIE Model

2.1 Analysis

The Analysis phase identified the core problem: beginners struggle to read and memorise music notation, which is abstract, symbol-based, and poorly supported by engaging digital tools. Note Quest was therefore conceptualised as a game-based mobile application to help novice learners master basic notation through structured practice and immediate feedback. Learning needs and target users were clarified. The primary audience consists of learners with minimal or no experience in reading music notation. To ensure content accuracy and pedagogical soundness, a music education expert was consulted. The expert reviewed proposed content such as note names, values, and question types, confirming alignment with foundational music education standards and suitability for beginners. His feedback ensured that the instructional content remained accurate, progressive, and manageable for self-directed learning.

2.2 Design

The Design phase translated learning objectives into an intuitive and engaging mobile game. The main goals were to support self-paced learning, reduce cognitive overload, and encourage repeated practice through gamified interaction.

UI and UX decisions were guided by multimedia learning principles and Nielsen's usability heuristics, emphasising clarity, consistency, feedback, and user control. The app structure was planned around three levels with increasing difficulty, each containing drag-and-drop questions on note recognition and values. Visual cues, immediate feedback, and simple navigation were prioritised to support visual and auditory learners.

The design process was iterative and included both low-fidelity and high-fidelity prototypes. Low-fidelity wireframes outlined the user flow (home screen, level selection, questions, feedback, and unlocked levels) and the basic progression rule that learners needed to complete earlier questions or levels before accessing later ones. Supervisor feedback highlighted issues such as weak colour contrast, unbalanced layouts, and limited content coverage. These comments informed later visual versions, which introduced improved colour schemes, clearer layouts, and additional questions, including percussion-related items.

The third and final design version integrated a refined layout, consistent visuals, a functioning level-locking system, and separate interfaces for gameplay and reference notes. Audio support was added for percussion questions and a notes reference screen allowed learners to review symbols independently. This final design, considered functionally complete, was used for expert formative evaluation and then for summative evaluation with only minor adjustments (Figure 2).

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Figure 2: Low Fidelity Prototype

2.3 Development and Implementation

During the Development phase, the approved design was translated into a functional application using Unity as the main development engine. Visual assets, including musical note symbols, buttons, and drag targets, were designed using Canva and integrated into Unity. Core features included drag-and-drop interactions, scoring and timing mechanisms, audio playback for selected notes, and level progression. A formative technical review was conducted with experts in music education and multimedia design to evaluate visual clarity, usability, responsiveness, and feedback effectiveness. Based on their feedback, improvements were made to icon size, spacing, sound feedback, timing simplicity, and score visibility.

In the Implementation phase, the finalised application was deployed on Android tablets as an APK file. The app was tested by experts and beginner learners to evaluate usability and learning support. Four experts conducted formative testing, followed by summative testing with thirty beginner music learners who used the app independently for 15 to 20 minutes.

2.4 Evaluation

The Evaluation phase comprised two components: formative evaluation with experts and summative evaluation with end users. Both components applied quantitative questionnaires, complemented by qualitative comments, to examine usability and perceived educational value.

2.4.1 Formative Evaluation

During formative evaluation, experts used the high-fidelity prototype and then completed structured Google Forms. Items were grouped under navigation, functionality, accessibility, interface design, and instructional content. Open-ended questions allowed experts to elaborate on strengths, weaknesses, and suggested improvements. This stage produced concrete design recommendations, resulting in clearer visual hierarchy, more stable interactions, richer audio cues, and the addition of reference and tutorial elements. Screenshots and form responses documented the validation process.

2.4.2 Summative Evaluation

The summative evaluation assessed the final Note Quest version with 30 beginner learners. After a single gameplay session of 15–20 minutes, participants completed a questionnaire using a five-point Likert scale. Items were grouped into four dimensions: navigation, functionality, accessibility, and interface.

Responses were collected immediately after gameplay and analysed using descriptive statistics. Mean scores indicated overall user satisfaction and perceived effectiveness of the application, while standard deviations reflected the consistency of user experience across participants. High mean values across the four dimensions suggested that Note Quest functioned as a usable and engaging tool for supporting beginner music notation learning, while relatively lower scores highlighted aspects for future refinement.

2.5 Previous Works

Conventional music theory instruction often emphasises repetitive practice and provides limited feedback, contributing to boredom and slow knowledge acquisition (da Silva et al., 2021). Therefore, innovative digital solutions are essential to promote active participation and sustained interest (Qian & Jiang, 2024).

Gamified mobile applications are increasingly used in music learning. A notable example is Yousician, which enables real-time notation support and feedback during instrument performance. While useful for practical skill acquisition, its focus is not on theoretical notation mastery (Tan & Thiruvarul, 2021). Similarly, Tenuto and NotateMe provide drills for note and rhythm recognition but lack motivational gaming dynamics such as progress rewards and narrative elements, limiting engagement over time (Galera-Núñez, 2024).

Studies highlight that gamification strengthens learning outcomes by offering continuous challenges and positive reinforcement (Alamri, 2024; Zainuddin et al., 2020). These mechanisms encourage repeated practice critical for developing fluency in music notation and benefit learners with differing styles and motivation levels. Rajendran et al.

(2024) further emphasise that teachers play an essential role in ensuring that gamified tools meet real classroom needs, reinforcing their value as pedagogical support rather than novelty.

Collectively, research supports that a specialised gamified system for music notation can fill the current instructional gap, enabling learners to practise foundational theory more effectively and enjoyably.

2.7 Multimedia and Usability Principles

For a gamified learning application to be effective, strong user experience (UX) design is essential. Nielsen's usability heuristics remain widely applied in contemporary educational technology due to their focus on simplicity, clarity, and error-free interaction. Principles such as visibility of system status, error prevention, and user control guide the creation of intuitive, frustration-free learning experiences (Vieira et al., 2019; Sobrino-Duque et al., 2022).

Additionally, multimedia learning principles emphasise meaningful integration of visuals, text, and audio to support cognitive processing. The segmenting principle, for example, suggests breaking lessons into smaller chunks to scaffold understanding (Katy Ieong et al., 2022). These principles directly influence Note Quest's design progressive learning levels, supportive hints, and immediate audiovisual feedback enhance learner confidence and reduce mental workload. The combination of gamification, UX heuristics, and multimedia principles supports Note Quest's goal of creating an enjoyable and pedagogically effective music notation learning environment.

3. RESULTS AND DISCUSSION

The results are based on two stages of evaluation: a formative evaluation with four expert reviewers (three multimedia/ID experts and one music content expert) and a summative evaluation with 30 beginner music learners. Both phases assessed Note Quest in terms of navigation, functionality, accessibility, interface design, and instructional content using Likert-scale questionnaires, supported by qualitative comments.

3.1 Formative Evaluation

The experts completed 30 Likert-scale items and open-ended questions. Quantitative results for navigation, functionality, accessibility, and interface are summarised in Table 1, while content-related feedback is captured in Table 2.

Table 1. Expert Evaluation on Navigation, Functionality, Accessibility, and Interface

No.	Question	Mean	SD
1–5	Navigation items	4.00–4.67	0.58–1.73
	Navigation Summary	4.40	0.27
6–10	Functionality items	4.67–5.00	0.00–0.58
	Functionality Summary	4.87	0.19
11–15	Accessibility items	3.67–4.33	0.58–1.73
	Accessibility Summary	3.93	0.31
16–20	Interface items	3.33–4.33	0.58–1.53
	Interface Summary	3.87	0.47

a. Navigation, Experts generally agreed that navigation was clear and intuitive (overall mean = 4.40). The "Play" and "Quit" buttons, level selection, and "Back to Menu" controls were seen as straightforward and supportive of user control. A minor suggestion was to include clearer onboarding or a short tutorial to help first-time users understand the game flow quickly.
b. Functionality, This dimension received the highest ratings (overall mean = 4.87). The drag-and-drop interaction was described as accurate and responsive, and correct/wrong answers triggered appropriate transitions and feedback. The level unlocking and reset functions worked as intended, though a confirmation prompt before resetting progress was recommended to prevent accidental data loss.
c. Accessibility, Accessibility scored slightly lower (mean = 3.93). Fonts and text size were considered readable, and colour use was mostly appropriate. However, experts suggested enhancements for inclusivity, such as alternative indicators (icons/patterns) for colour-blind users and options to adjust font size or themes to support users with visual impairments.
d. Interface Design, Interface items (mean = 3.87) indicated that the layout was generally clean, organised, and consistent. Experts appreciated the clear separation between interactive elements and navigation controls but recommended stronger visual contrast, better spacing, and more visually engaging graphics to reduce cognitive load and improve aesthetic appeal.

Table 2. Expert Feedback on Content and Instructional Quality (Items 21–30)

No.	Interview Question	Expert Response
21	Are the music notes shown in the game accurate and relevant?	The expert found the note sounds inappropriate and recommended using percussion sounds to better support recognition and clarity for beginner learners.

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No.	Interview Question	Expert Response
22	Does the audio for each note match the written notation?	Audio does not match the visual notation accurately. The expert suggested adding sound visualizations to help users better associate what they hear with what they see.
23	Does the content align with basic music theory?	The expert confirmed strong alignment with basic theory and encouraged continuing development, describing the product as a solid foundation for beginners in music theory.
24	Is the content suitable for beginner learners?	The content is suitable for beginners. To further support them, clearer scaffolding and gradually increasing difficulty levels are recommended.
25	Does the app help users connect sound with notation?	Because of incorrect audio mapping, the connection between sound and notation is weak. This can be improved by using correct audio and adding interactive feedback.
26	Does the game support both listening and reading skills?	Currently, it mainly supports reading. To support listening, audio must be corrected and enhanced with multimedia integration and visual-audio links.
27	Are the learning goals of the game clear and appropriate?	The expert suggested reordering note arrangements and adding a tutorial to improve clarity and support first-time users in understanding the game objectives.
28	Does the game provide knowledge of basic music notes?	The game introduces basic note concepts well. The inclusion of time signatures such as 4/4, is recommended to support rhythmic understanding.
29	Is there sufficient repetition to reinforce learning and memory?	Repetition is a strength of the game and effectively supports memory. This feature should be retained as part of the instructional design.
30	Does the content align with beginner music curriculum standards?	The game is mostly aligned with beginner standards. Continued alignment through curriculum-based content planning will ensure better integration into educational settings.

Experts agreed that *Note Quest* appropriately introduces basic musical note concepts and staff positioning for beginner learners. The application provides effective repetition that supports practice and memory retention and is generally aligned with beginner music curriculum standards, although stronger and more systematic integration with formal syllabi was recommended.

Several areas for improvement were identified. Experts noted an audio–notation mismatch in which some sounds did not accurately correspond to their visual notation. They recommended clearer, percussion-based sounds and the addition of simple sound–visual links, such as animations or visualisers, to strengthen audio–visual associations. The app was also found to focus mainly on notation reading, with limited support for listening skills. To address this, experts suggested improving audio accuracy and incorporating richer multimedia feedback. In terms of scaffolding, they recommended a clearer tutorial, improved note sequencing, and more explicit progression to guide learners through increasing difficulty levels. Finally, the inclusion of rhythmic elements, such as time signatures and basic rhythm concepts, was recommended to extend learning beyond pitch recognition. Overall, the formative evaluation showed that Note Quest is strong in navigation, functionality, and basic content design, but requires improvement in audio accuracy, accessibility, and visual appeal. These findings were used to refine the app before summative testing with learners. Table 3 shows the adjustments made after the comments.

Table 3. Adjustments Made After the Comments

Note Quest Version 3 Design	Note Quest Revised Interface (After Expert Feedback)
 Level Selection Interface	 The layout was redesigned to better reflect the musical theme of the app, making it more engaging and visually consistent. The lock design was also revised to ensure the locked levels stood out more clearly, using colour contrast to improve visibility. Additional features such as the time signature, a resume button, and a highest score display were added to increase user motivation and usability.

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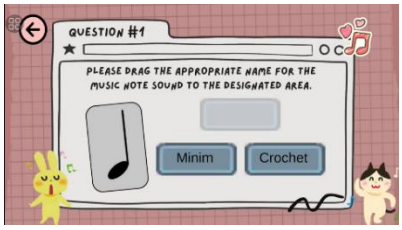
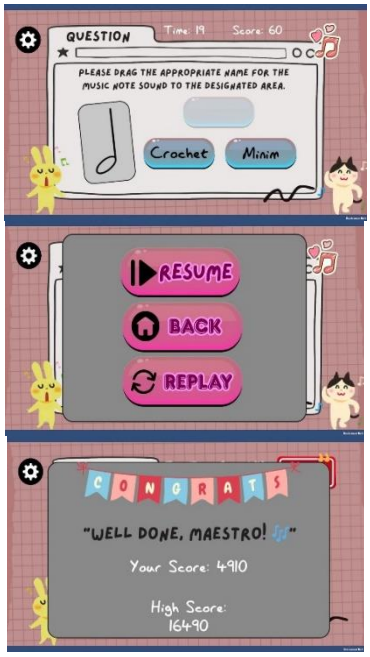
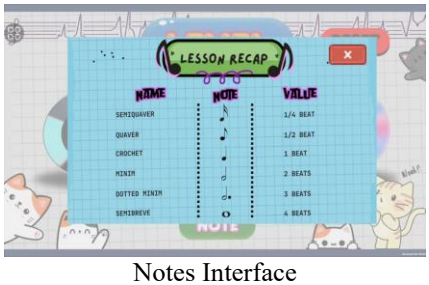
Note Quest Version 3 Design	Note Quest Revised Interface (After Expert Feedback)
 Popup Level Interface	 The font was made more consistent and enlarged for better readability and visual balance.
 Gameplay 1 Interface	 Several functional upgrades were introduced. These included a popup menu, as well as resume, back, and replay buttons, which allow users to pause, return to the main menu, or restart gameplay without confusion. A new result popup was also added to display the player's current score alongside the highest score achieved, encouraging progress and replayability. Sound effects were added to indicate correct and incorrect answers, providing instant audio feedback to reinforce learning. Additionally, the font and answer layout were refined to maintain consistency and improve user focus during gameplay.
 Notes Interface	 The arrangement of music notations was reorganized for logical flow, and audio percussion sounds were added based on expert suggestions.

3.2 Summative Evaluation

The summative evaluation involved 30 beginner music learners, each using Note Quest for approximately 20–30 minutes before completing a 16-item questionnaire. Items were grouped into four categories: navigation, functionality, accessibility, and interface. The results are summarised in Table 4.

Table 4. Learner Evaluation of Note Quest (N = 30)

No.	Question (Dimension)	M	SD
1–4	Navigation	3.71–4.39	0.84–1.40
5–8	Functionality	4.32–4.45	1.03–1.11
9–12	Accessibility	4.26–4.42	0.92–1.05
13–16	Interface	4.42–4.58	0.85–1.15

The summative evaluation results indicate that *Note Quest* is generally easy to use and well received by beginner learners. In terms of navigation, learners found it easy to start and play the game and to understand the required actions after hearing each note, although a small number reported occasional confusion, suggesting that a brief introductory tutorial could improve clarity. Functionality received consistently high ratings, with learners confirming that audio playback, drag-and-drop interactions, feedback, and progression between questions worked smoothly and reliably. Accessibility was also rated positively, as learners felt they had sufficient time to respond and could interact comfortably with the interface, though clearer instructions could further support some users. Interface design achieved the highest scores, particularly for the clarity of note images, colour usage, layout, and text readability. Overall, the findings demonstrate that *Note Quest* is usable, engaging, and visually clear, with strong functionality and interface design, while minor navigation enhancements could further improve first-time user experience.

3.3 Discussion

The main aim of this research was to design and evaluate Note Quest, a mobile game-based application to support beginners in learning basic music notation. Findings from both the formative and summative evaluations indicate that the app broadly meets its educational goals: it is functional, usable, and generally enjoyable, while still leaving room for improvement in accessibility, guidance, and instructional depth.

3.3.1 Interpretation of Findings

The formative evaluation with four experts showed that functionality was the strongest aspect of Note Quest (M = 4.87). The drag-and-drop mechanism, responsiveness of buttons, and smooth transition between questions were all praised. This level of technical reliability is crucial for beginners who may already feel anxious about music theory; a predictable and stable system helps build confidence.

Navigation was also rated positively (M = 4.40). Experts reported that users would likely be able to explore the app with minimal assistance, supporting its goal of self-directed learning. However, accessibility (M = 3.93) and interface design (M = 3.87) received more moderate scores. Concerns included limited contrast, lack of customisation options, and minimal support for users with visual or motor difficulties. These comments highlight the need to incorporate more inclusive design features.

From a content perspective, experts agreed that the app provides an appropriate introduction to basic notes and staff positions, but felt that the instructional layer was still too narrow. Rhythm, time signatures, and clearer explanations for wrong answers were underdeveloped, limiting deeper conceptual understanding.

In response to this feedback, several revisions were made before summative testing. Version 3 of Note Quest included a redesigned level selection screen with clearer locks, time signature display, a resume button, and highest-score indicators to motivate replay. The gameplay interface was improved with popup menus, resume/back/replay buttons, a result popup showing current and best scores, and refined fonts and layouts. Audio feedback for correct and incorrect answers was added, and the Notes interface was reorganised with percussion sounds to strengthen sound–symbol association.

The summative evaluation with 30 beginners further confirmed that Note Quest functions well as an introductory learning tool. Interface design received the highest ratings (M = 4.48), suggesting that the visual layout, colours, and clarity of music note images supported learning and engagement. Functionality (M = 4.40) and accessibility (M = 4.35) were also rated highly, indicating that users found the app responsive and comfortable to use on tablets.

Navigation, while still positive (M = 4.17), showed the most room for improvement. The item “Did you feel lost or confused at any point?” recorded the lowest mean (M = 3.71), suggesting that some learners experienced uncertainty at the start or when moving between levels. This aligns with expert comments and points to the value of stronger onboarding such as a brief interactive tutorial or clearer initial prompts. Overall, both experts and learners agreed that Note Quest supports independent, gamified practice in music note recognition. The app is already effective at its core task, but can be enhanced further through richer feedback, broader theory coverage, and better inclusion.

3.3.2 Comparison with Previous Studies

The findings are consistent with literature on gamified learning and multimedia instruction. Prior studies (e.g., Deterding et al., 2021; Zainuddin et al., 2020) show that game elements such as points, progress indicators, and immediate feedback can increase motivation and persistence. Note Quest applies these principles via level-based progression, scoring, and instant visual/audio feedback.

The app also reflects Mayer’s multimedia principles, particularly dual-channel processing and coherence. Learners pair auditory information (note sounds) with visual notation in a clean interface with minimal distractions. From a

usability perspective, Note Quest aligns with Nielsen's heuristics by providing clear system feedback, visible status, and user control (e.g., replay and back buttons).

Unlike apps such as Yousician or Tenuto, which are heavily performance-oriented, Note Quest specifically targets theoretical notation skills. It therefore fills a niche as a pre-instrumental or complementary tool for building foundational music-reading ability.

3.4 Implications for Learning and Practice

The results indicate that *Note Quest* can serve as a useful supplement in beginner music education. Teachers may use the application for in-class reinforcement, independent homework practice, or as part of a blended learning approach that combines instruction with self-paced activities. Its low-pressure, game-based design can reduce anxiety and encourage repetition, which is important for memorising note names and positions. The findings also suggest potential for inclusive practice, as additional accessibility features could further support diverse learners.

3.5 Limitations and Future Development

Several limitations should be acknowledged in this study. The formative evaluation involved only four experts, and a larger or more diverse group, particularly those with expertise in special education or accessibility, may have identified additional issues. The summative evaluation was limited to beginner learners, so the application's effectiveness for intermediate or advanced users remains unknown. In addition, the app was tested only on Android tablets, and its performance on other devices was not examined. The study also relied mainly on Likert-scale data, which limited deeper insights into user motivation and experience.

Future development of *Note Quest* should prioritise stronger onboarding support, expanded musical content, and enhanced accessibility features. Further studies should examine long-term learning outcomes, include comparative evaluations, and ensure consistent performance across multiple platforms.

4. CONCLUSION

This study demonstrates that Note Quest, a gamified mobile application, has strong potential to make learning basic music notation more accessible, interactive, and engaging for beginners. Through drag-and-drop gameplay, immediate feedback, and structured levels, the app successfully supports note recognition and encourages independent practice. Formative evaluation with experts enabled targeted improvements in interface design, functionality, and instructional clarity, while summative evaluation with beginner learners confirmed high usability and positive user experience. At the same time, the project highlighted important areas for further enhancement, particularly in accessibility, navigation guidance, and expansion of theoretical content. Overall, Note Quest emerges as a promising digital tool for music educators and self-directed learners. With continued refinement and broader testing, it can evolve into a more comprehensive and inclusive learning aid for music theory education.

REFERENCES

Alabdullah, B., Khenissi, M. A., & Almjally, A. (2024, June). Exploring the impact of gamified learning on student motivation in computer science education.

Alamri, I. K. A. (2024). Gameful learning: Investigating the impact of game elements, interactivity, and learning style on student success. *Multidisciplinary Science Journal*, *7*(3), 2025108.

Azman, M. N. A., Ruslan, S., Ab-Latif, Z., & Pratama, H. (2023). The development of mobile application software MyNutrient in the Home Science subject. *Asian Journal of University Education*, *19*(1), 28–38.

Baah, C., Govender, I., & Subramaniam, P. R. (2023, May). Exploring the role of gamification in motivating students to learn.

Bent, I. D. (2024, October 3). Musical notation: Description, systems, and note symbols. *Encyclopedia Britannica*.

Carrascosa, C. L., Ylardia, I. P., Paredes-Velasco, M., & García-Suelto, M. d. C. N. (2024). Game-based learning with augmented reality for history education. *IEEE Xplore*.

da Silva, B. M., et al. (2021). GuitarEasy – An interactive approach to the study of music theory. In *2021 16th Iberian Conference on Information Systems and Technologies (CISTI)*. IEEE.

Del Rio-Guerra, M. S., Martin-Gutierrez, J., Lopez-Chao, V. A., Parra, R. F., & Sosa, M. A. R. (2019). AR graphic representation of musical notes for self-learning on guitar. *Applied Sciences*, *9*(21), 4527.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2021). From game design elements to gamefulness: Defining "gamification". *Journal of Human-Computer Interaction*, *39*(1), 1–15.

Galera-Núñez, M. (2024, April). Music reading and music notation software: A multiple-case study.

Ho Weatherly, K. I. C., Wright, B., & Lee, E. Y. (2024). Digital game–based learning in music education: A systematic review between 2011 and 2023.

Imran, M., Almusharraf, N., Ahmed, S., & Mansoor, M. I. (2024). Personalization of e-learning: Future trends, opportunities, and challenges. *International Journal of Interactive Mobile Technologies (iJIM)*, *18*(10), 4–18.

Ishak, S. F., Zaki, Z. M., Mohamad, K. A., Sayuti, M. N. S. M., Bahrin, M. A. M., Abdul Roni, N. H., & Musa, M. A. (2018). Formative evaluation of an educational mobile application: An interactive MyQiraat application. *International Journal of Engineering & Technology*, *7*(4.15), 75–79.

Khaleel, F. L., Ashaari, N. S., & Wook, T. S. M. T. (2020). The impact of gamification on students' learning engagement.

Lu, D. (2024). The impact of augmented reality on motor skills in piano education: Improving the left-hand technique with AR piano. *International Journal of Human-Computer Interaction*, 1–11.

Qian, C., & Jiang, M. (2024). Exploring the effects of digital game-based learning on music education. *Studies in Social Science & Humanities*, *3*(5), 6–9.

Rajendran, M., Ray, M., Ilangovan, A., Xavier, Y. C. S., & Parthasarathy, G. (2024). Game-based learning and its impact on students' motivation and academic performance. *Multidisciplinary Reviews*, *8*(3), 2025074.

Rapaka, A., Dharmadhikari, S. C., Kasat, K., Mohan, C. R., Chouhan, K., & Gupta, M. (2024). Revolutionizing learning: A journey into educational games with immersive and AI technologies.

Rodrigues, R., & Pombo, L. (2024). The potential of a mobile augmented reality game in education for sustainability: Report and analysis of an activity with the EduCITY app. *Sustainability*, *16*(21), 9357.

Sobrino-Duque, R., Martínez-Rojo, N., Carrillo-de-Gea, J. M., López Jiménez, J. J., Nicolás, J., & Fernández-Alemán, J. L. (2022, May). Evaluating a gamification proposal for learning usability heuristics: Heureka. *ScienceDirect*.

Tan, Y. Y., & Thiruvarul, S. (2021). Understanding the potential of music learning applications as tools for learning and practicing musical skills. *International Journal of Computer Science in Sport*.

Vieira, E. A. O., da Silveira, A. C., & Martins, R. X. (2019, November). Heuristic evaluation on usability of educational games: A systematic review. *ResearchGate*.

Yussop, Y. M., S. Annamalai, and S. A. Salam. "Hi-math mobile app: Effectiveness in improving arithmetic skills of primary school students." International Journal of Recent Technology and Engineering 7.6 (2019): 67-71.

.Zainal Abidin, S., Salam, A., Nur, S., Abdul Mutalib, A., & Ismail, S. (2016). Validating an integrated multimedia presentation conceptual model through expert reviews. Journal of Telecommunication, Electronic and Computer Engineering, 8(8), 161-163.

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020, March). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *ResearchGate*.