

Comparing User Experience Poro and Obenkyou Applications Using the User Experience Questionnaire

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abstract

The success of educational apps is closely tied to the quality of user experience (UX). This study compared the UX of two Japanese language learning apps, Poro and Obenkyou, to examine the impact of different instructional designs. Sixty-five respondents, all of whom had used both apps for at least one week, rated six UX dimensions-Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty-using the User Experience Questionnaire (UEQ). Data analysis using the official UEQ tool and independent t-tests showed that both apps received positive ratings on all dimensions, but Poro consistently achieved higher mean scores (e.g., Attractiveness: 1.83 vs. 1.18; Stimulation: 1.89 vs. 1.13). These results indicate a significant difference in user perceptions, with gamification contributing to better UX. This study highlights the importance of design strategies in educational apps.

abstrak

Keberhasilan aplikasi pendidikan terkait erat dengan kualitas pengalaman pengguna (UX). Studi ini membandingkan UX dari dua aplikasi pembelajaran bahasa Jepang, Poro dan Obenkyou, untuk memeriksa dampak dari desain instruksional yang berbeda. Enam puluh lima responden, yang semuanya telah menggunakan kedua aplikasi setidaknya selama satu minggu, menilai enam dimensi UX-Daya Tarik, Kejelasan, Efisiensi, Keandalan, Stimulasi, dan Kebaruan-menggunakan Kuesioner Pengalaman Pengguna (UEQ). Analisis data menggunakan alat UEQ resmi dan uji-t independen menunjukkan bahwa kedua aplikasi menerima peringkat positif pada semua dimensi, tetapi Poro secara konsisten mencapai skor rata-rata yang lebih tinggi (misalnya, Daya Tarik: 1,83 vs. 1,18; Stimulasi: 1,89 vs. 1,13). Hasil ini menunjukkan perbedaan yang signifikan dalam persepsi pengguna, dengan gamifikasi berkontribusi pada UX yang lebih baik. Studi ini menyoroti pentingnya strategi desain dalam aplikasi pendidikan.

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Association for Computing Machinery

ACM Computing Classification System (CCS)

EBSCOhost

Communication and Mass Media Complete (CMMC)

1. Introduction

User Experience (UX) is a key factor that impacts both the adoption and success of mobile applications. UX encompasses the overall perception users have when engaging with an application, including the design of the user interface (UI), their interaction with various features, and the level of satisfaction experienced during use. A positive user experience has the potential to increase user loyalty, extend the duration of app usage, and reduce churn rates. Thus, it is important to evaluate UX in apps that have a wide audience, including apps used for educational purposes. This research focuses on two educational apps, Poro and Obenkyou, which have different characteristics in terms of learning approach and user interface. Poro integrates gamification elements to create a more enjoyable and interactive learning experience, while Obenkyou prioritizes text-based learning and more conventional practice questions. These two apps were chosen because they offer different approaches to delivering educational material, which can result in a varied user experience. Therefore, a comparison of the user experience between these two apps is important (Mujinga, 2023; Lampropoulos & Sidiropoulos, 2024).

The selection of Poro and Obenkyou is supported by their popularity and reach among Japanese language learners. According to the Google Play Store (accessed May 2025), Poro has over 1 million downloads and a 4.9/5 rating, while Obenkyou has more than 1 million downloads and a 4.6/5 rating. These numbers indicate a substantial user base and justify their selection for deeper analysis. Both applications also have unique features that distinguish them. Poro offers interactive dialogues, native speaker audio, and practice games to engage users, while Obenkyou focuses on kanji practice, writing tests, and a minimalist interface designed for self-study. The importance of UX in educational apps is also supported by empirical evidence that educational applications with strong UX design can improve learning retention by up to 35% compared to poorly designed ones (Müller *et al.*, 2024). To measure and compare user experience in these two applications, the User Experience Questionnaire (UEQ) method is employed. UEQ is a tool designed

to evaluate user experience by measuring several dimensions such as efficiency, aesthetics, interaction quality, and overall user satisfaction (Dewi *et al.*, 2020). This method has been used in various studies to evaluate UX in mobile applications, including educational applications, due to its ability to provide a clear picture of application quality (Kumar & Chand, 2024). By using UEQ, this study can provide objective insights into the UX aspects that need improvement in both apps (Anderies *et al.*, 2023; Saleh *et al.*, 2022). Some previous studies have discussed UX in educational apps with different approaches, but no study has directly compared the user experience between gamified and text-based apps (Hussain *et al.*, 2020; Abuaddous *et al.*, 2022). Previous studies have discussed UX evaluation of educational apps in general but did not highlight comparisons between apps and their appeal values in depth (Noor & Hadisaputro, 2022). Additionally, research by Anderies *et al.* (2023) assessed the UX of the Duolingo application using the UEQ but did not provide an in-depth comparison between apps with different design approaches and functionalities. However, existing studies tend to be general and do not explicitly investigate how different instructional designs impact user experience. For example, research by Saputra and Kania (2022) as well as Nasution and Nusa (2021) emphasized the importance of user experience in educational applications and described the design process, but did not perform direct comparisons between applications with contrasting instructional design strategies. Both studies focused on the development and evaluation of UX in a single application rather than comparative analysis across different instructional approaches. This research gap lies in the lack of direct comparisons between educational apps with different learning approaches, which could provide further insight into how app design affects user experience. This study aims to address the identified gap by assessing and comparing user experiences of the Poro and Obenkyou applications using the UEQ method. The results are anticipated to provide meaningful input for developers of educational applications in designing apps that are more efficient, interactive, and user-centered, as well as enrich the academic discussion surrounding UX in the realm of educational applications (Yang *et al.*, 2023; Almasri *et al.*, 2021).

2. Research Methodology

This research adopts a literature review approach, which involves the process of investigating, gathering, and analyzing scholarly sources relevant to the research topic (Smith, 2023). The purpose of this stage is to gain an in-depth understanding of previous studies conducted by other researchers, as well as to identify knowledge gaps or new opportunities that can form the basis for further research (Johnson, 2024). Furthermore, this study employs a quantitative approach, utilizing a survey method with the User Experience Questionnaire (UEQ) to assess and compare the user experiences of the Poro and Obenkyou applications. The UEQ is one of the tools used to assess how users interact with a system. This method helps researchers carry out evaluations more easily since it provides a freely accessible framework, which can be found on the official UEQ website. The UEQ includes several core dimensions that are used to evaluate the user experience of a product or system (Lee *et al.*, 2022):

1) Attractiveness

This dimension aims to measure the extent to which the product is able to attract attention and give a positive impression to users (Brown, 2023).

2) Perspicuity

This dimension assesses the level of ease users have in understanding and operating the system (Taylor, 2024).

3) Efficiency

This dimension refers to how effectively the system helps users complete tasks quickly and accurately.

4) Dependability

This dimension reflects the extent to which users feel safe and in control when interacting with the system.

5) Stimulation

This dimension evaluates the system's capacity to deliver an enjoyable experience and encourage users to keep engaging with it (Lee *et al.*, 2022).

6) Novelty

This dimension evaluates the level of creativity and innovation offered by the system, assessing whether it provides a fresh impression to users (Brown, 2023).

A total of 65 respondents participated in filling out the questionnaire. Each respondent was asked to rate two applications, resulting in a total of 130 datasets (2 x 65). However, to ensure sample adequacy, a power analysis calculation will be conducted to determine whether the number of respondents (n=65) is representative enough for the statistical analysis performed. Respondents consisted of students who had experience using both applications. The respondent selection process involved inclusion criteria, namely respondents who had experience using Japanese language education applications, as well as exclusion criteria to avoid bias from irrelevant respondents. Further explanations of the demographic characteristics of respondents, such as Japanese language proficiency level and previous experience with similar applications, were provided to ensure that the sample used was relevant and unbiased. The instrument used was the UEQ, which consists of 26 items per application with a bipolar scale from -3 (negative) to +3 (positive) (Lee *et al.*, 2022).

Table 1. User Experience Questionnaire Items

No	Left (Negative)	Grading Scale	Right(Positive)
1a	Annoying	○ ○ ○ ○ ○ ○ ○ ○	Enjoyable
2p	Not understandable	○ ○ ○ ○ ○ ○ ○ ○	Understandable
3n	Creative	○ ○ ○ ○ ○ ○ ○ ○	Dull
4p	Easy to learn	○ ○ ○ ○ ○ ○ ○ ○	Difficult to learn
5s	Valuable	○ ○ ○ ○ ○ ○ ○ ○	Inferior
6s	Boring	○ ○ ○ ○ ○ ○ ○ ○	Exciting
7s	Not interesting	○ ○ ○ ○ ○ ○ ○ ○	Interesting
8d	Unpredictable	○ ○ ○ ○ ○ ○ ○ ○	Predictable

9e	Fast	○ ○ ○ ○ ○ ○ ○ ○	Slow
10n	Inventive	○ ○ ○ ○ ○ ○ ○ ○	Conventional
11d	Obstructive	○ ○ ○ ○ ○ ○ ○ ○	Supportive
12a	Good	○ ○ ○ ○ ○ ○ ○ ○	Bad
13p	Complicated	○ ○ ○ ○ ○ ○ ○ ○	Easy
14a	Unlikable	○ ○ ○ ○ ○ ○ ○ ○	Pleasing
15n	Usual	○ ○ ○ ○ ○ ○ ○ ○	Leading edge
16a	Unpleasant	○ ○ ○ ○ ○ ○ ○ ○	Pleasant
17d	Secure	○ ○ ○ ○ ○ ○ ○ ○	Not secure
18s	Motivating	○ ○ ○ ○ ○ ○ ○ ○	Demotivating
19d	Meets expectations	○ ○ ○ ○ ○ ○ ○ ○	Does not meet expectations
20e	Inefficient	○ ○ ○ ○ ○ ○ ○ ○	Efficient
21p	Clear	○ ○ ○ ○ ○ ○ ○ ○	Confusing
22e	Impractical	○ ○ ○ ○ ○ ○ ○ ○	Practical
23e	Organized	○ ○ ○ ○ ○ ○ ○ ○	Cluttered
24a	Attractive	○ ○ ○ ○ ○ ○ ○ ○	Unattractive
25a	Friendly	○ ○ ○ ○ ○ ○ ○ ○	Unfriendly
26n	Conservative	○ ○ ○ ○ ○ ○ ○ ○	Innovative

Description:

a = Attractiveness aspect

e = Efficiency aspect

s = Stimulation aspect

p = Perspicuity aspect

d = Dependability aspect

n = Novelty aspect

Respondent data obtained through Excel was then converted based on a predetermined rating scale. In the questionnaire design, the scale values are arranged from negative responses on the left to positive responses on the right, although the order of the items is randomized to minimize response bias. This strategy was implemented to reduce potential bias or specific tendencies in respondents' answers (Miller, 2023). Randomizing the order of items helps ensure that the responses reflect genuine user experiences rather than being influenced by the sequence in which questions are presented (Anderson & Lee, 2024).

Table 2. User Experience Questionnaire Item Scale

Initial Scale	1	2	3	4	5	6	7
Conversion Scale	-3	-2	-1	0	1	2	3

The data that has gone through the conversion process is then processed to obtain the average value of each respondent, in accordance with the categories grouped based on a predetermined rating scale.

$$x = \frac{\sum x[\text{person}]}{\sum \text{point}}$$

Description:

x = average scale per person

$\sum x[\text{person}]$ = total point value per scale

$\sum \text{points}$ = number of points per scale

The data that has undergone the conversion process is then processed to obtain the main result, which is the User Experience Questionnaire (UEQ) outcome. This result serves as the primary reference for subsequent calculations, specifically for benchmarking. At this stage, the overall scale and the assumption scales (attractiveness, hedonic quality, pragmatic quality) are calculated based on the average conversion data obtained from each predetermined scale (Smith & Johnson, 2023). The mean score on the scale is standardized, with the following interpretation: scores below -0.8 are classified as

negative, scores ranging from -0.8 to 0.8 are considered neutral or average, and scores above 0.8 are regarded as positive (Davis, 2024). During online data collection, we ensured ecological validity by selecting an easily accessible platform and maintaining a sufficiently long data collection period to obtain representative responses from users who had real experience with the apps. To minimize common method bias, we randomized the order of items in the questionnaire and provided clear instructions to respondents, ensuring they could understand the questions consistently and were not influenced by specific biases (Miller, 2023). In data analysis, a t-test was employed to compare UX scores between the Poro and Obenkyou apps. We ensured that the assumptions of normality of data distribution and homogeneity of variance were met before conducting the t-test, with detailed steps for testing these assumptions provided in the methodology section (Anderson & Lee, 2024).

3. Results and Discussion

Results

The user experience of the Poro and Obenkyou applications was evaluated using the User Experience Questionnaire (UEQ) method. Each participant answered 26 questions for each app, resulting in a total of 52 questions per respondent. Data was successfully gathered from 65 participants. In the final phase of analysis, the collected data were processed using the UEQ analysis tool, available through the official UEQ website (Lee *et al.*, 2022).

Cronbach Alpha Coefficient Analysis

Cronbach Alpha values for all UEQ dimensions in both applications show values above 0.7, indicating that the items in each dimension have good internal consistency (Brown, 2023). This strengthens the validity of the measurement, ensuring that the results obtained can be trusted to accurately describe user perceptions. The high consistency reflects that users rate each UX dimension relatively uniformly, thereby reducing the possibility of ambiguity in understanding the items (Taylor, 2024).

Table 3. Cronbach Alpha Coefficient Value

Scale	Cronbach Alpha Coefficient Value	
	Poro	Obenkyou
Attractiveness	0.90	0.97
Perspiciuity	0.88	0.94
Efficiency	0.87	0.97
Dependability	0.89	0.95
Stimulation	0.87	0.93
Novelty	0.87	0.96

UX Value Analysis of Poro App

The scoring range of the User Experience Questionnaire (UEQ) extends from -3 to +3, where -3 signifies the lowest level of user satisfaction, +3 indicates the highest level of positive evaluation, and 0 reflects a neutral stance (Davis, 2024). In the case of the Poro application, the scores on each UX dimension are above +1, with the Stimulation aspect receiving the highest value. This outcome demonstrates that the gamification techniques employed by Poro successfully foster a fun and motivating learning environment. According to Keller's ARCS model, which emphasizes Attention,

Relevance, Confidence, and Satisfaction (Smith & Johnson, 2023), Poro's effectiveness in the Stimulation dimension implies that the application has not only captured users' attention but also sustained their motivation throughout the learning journey. This achievement is crucial for educational applications, as maintaining user engagement can significantly enhance learning outcomes. The positive evaluations across other dimensions further indicate that users find Poro to be a valuable tool for their learning needs, reinforcing its potential as a leading educational platform.



Figure 1. UEQ scale of each Poro application item

The accumulated UEQ scales for the different Poro application variables are graphically represented in Figure 2.

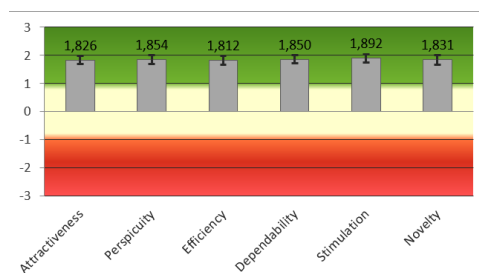


Figure 2. UEQ Scale Graph for Each Variable in the Poro Application

The UEQ scale graph per variable for the Poro app shows scores above +1 for all dimensions, indicating that the user experience is consistently positive. The Stimulation dimension received the highest score, suggesting that users felt motivated and emotionally engaged during the learning process. This aligns with the gamification approach implemented in Poro, which is designed to create a fun and non-monotonous learning experience. Conversely, the Efficiency dimension occupies the lowest score position, although it remains within the positive category. This indicates that while the app is generally regarded as efficient, users may still encounter some barriers regarding the speed or ease of use of certain features (Lee *et al.*, 2022).

UX Value Analysis of Obenkyou App

On the other hand, the Obenkyou app also achieved a positive score, with the highest value in the Novelty dimension and the lowest in Dependability. This discrepancy can be attributed to limitations in the user interface that may hinder the perception of system reliability. Previous research has demonstrated that the complexity of interface design directly impacts users' perceptions of application reliability (Brown, 2023).

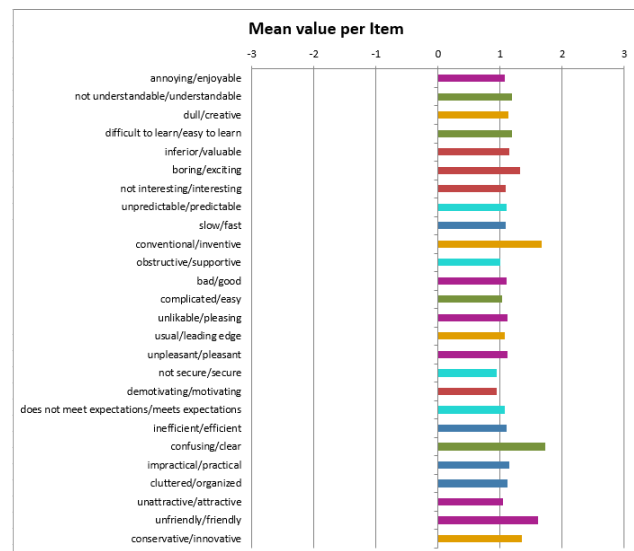


Figure 3. UEQ scale of each Obenkyou application item

As illustrated in Figure 3 and Figure 4, the Obenkyou app achieves a score higher than +1 in both the pragmatic and hedonic quality categories, suggesting that users have given favorable ratings to their experience with the app.

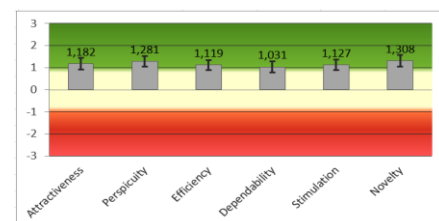


Figure 4. UEQ Scale Graph for Each Variable in the Obenkyou Application

In the Obenkyou app, the UEQ graph also shows positive values across all dimensions, although the scores tend to be lower than those of Poro. The Novelty dimension received the highest score,

suggesting that users appreciate unique or different learning approaches, even if they are text-based. However, the lowest score was recorded in the Dependability dimension, indicating users' doubts about the reliability and consistency of the system. This could be attributed to a less responsive interface design or features that do not operate consistently, which negatively impacts users' perceived trust in the app (Taylor, 2024).

T-Test Analysis Results

The t-test is applied to assess whether there is a significant difference in the ratings between the two applications, based on the analyzed categories. The results of the t-test are displayed in Table, which presents a comparison of the average scores and significance levels for the Poro and Obenkyou apps (Anderson & Lee, 2023).

Table 4. The UEQ scale is based on the grouping of applications

Scale	Scale Mean			Significant Result
	Poro	Obenkyou		
Attractiveness	1.83	1.18	0.0000	Significant Difference
Perspicuity	1.85	1.28	0.0002	Significant Difference
Efficiency	1.81	1.12	0.0000	Significant Difference
Dependability	1.85	1.03	0.0000	Significant Difference
Stimulation	1.89	1.13	0.0000	Significant Difference
Novelty	1.83	1.31	0.0013	Significant Difference

The t-test revealed a significant difference between the UX scores of the Poro and Obenkyou apps across all dimensions ($p < 0.05$). While both apps demonstrated positive performance, Poro consistently excelled in all aspects. This difference is not only statistically significant but also practically important, as it reflects the real impact of the design approach on user experience. The use of gamification has proven to enhance user engagement and

satisfaction compared to conventional text-based approaches (Smith & Johnson, 2023). However, the Efficiency dimension in Poro and the Dependability dimension in Obenkyou were still the lowest scores for each application. This serves as an important indicator that both efficiency (ease and speed of use) and reliability (consistency and trust in the system) still require improvement (Davis, 2024).

Table 5. UEQ Scale Benchmark Poro App

Scale	Mean	Comparison to Benchmark	Interpretation
Attractiveness	1.83	Good	10% of results better, 75% of results worse
Perspicuity	1.85	Good	10% of results better, 75% of results worse
Efficiency	1.81	Good	10% of results better, 75% of results worse
Dependability	1.85	Excellent	In the range of the 10% best results
Stimulation	1.89	Excellent	In the range of the 10% best results
Novelty	1.83	Excellent	In the range of the 10% best results

Table 6. UEQ Scale Benchmark Obenkyou App

Scale	Mean	Comparison to Benchmark	Interpretation
Attractiveness	1.18	Above average	25% of results better, 50% of results worse
Perspicuity	1.28	Above average	25% of results better, 50% of results worse
Efficiency	1.12	Above average	25% of results better, 50% of results worse
Dependability	1.03	Below Average	50% of results better, 25% of results worse
Stimulation	1.13	Above average	25% of results better, 50% of results worse
Novelty	1.31	Good	10% of results better, 75% of results worse

The UEQ benchmark results indicate that the Poro app achieved the “Excellent” category in three main dimensions: Stimulation, Dependability, and Novelty. In other dimensions, such as Attractiveness, Perspicuity, and Efficiency, Poro remains in the “Good” category. This suggests that from a user perspective, Poro is not only enjoyable to use (stimulating) and innovative, but also provides a sense of security and reliability. This achievement is likely influenced by the integration of gamification elements that enhance user motivation and emotional engagement. In the context of Keller's ARCS theory, the high scores in Stimulation and Novelty demonstrate success in fulfilling the Attention and Satisfaction aspects, which are critical in user-oriented educational app design (Keller, 2023). In contrast, the Obenkyou app scored “Good” only in the Novelty dimension and was categorized as “Above Average” in Attractiveness, Perspicuity, Efficiency, and Stimulation. However, the Dependability dimension received a “Below Average” score, indicating a low user perception of the system's reliability and consistency. This may be attributed to a less intuitive interface or insufficient feedback regarding feature usage. This finding aligns with previous research, which states that complex interfaces and a lack of adaptive interaction often diminish perceptions of reliability (Brown, 2023).

Given these results, recommendations for application development should be more targeted and data-driven rather than generalized. Some strategic recommendations include:

1) For Poro

Despite high overall scores, the Efficiency dimension still requires improvement. Developers should conduct interaction audits to minimize unnecessary steps in using key features and optimize system response times. To maintain high scores in Stimulation and Novelty, regular updates to content, visual design, and learning challenges are essential to prevent user boredom.

2) For Obenkyou

The primary focus should be on enhancing Dependability. This can be achieved by improving the clarity of system feedback, adding error prevention features, and simplifying complex navigation flows. Additionally, improving Efficiency is crucial by ensuring that all key

features are easily accessible without complicated processes. Since Novelty scores well, creative approaches to material presentation can serve as an entry point to enhance other dimensions. For instance, developing interactive visual features for practice questions or implementing a learning progress tracking system could be beneficial.

Thus, benchmarking serves not only as a quantitative indicator of UX performance but also as a foundation for strategic decision-making in the development and maintenance of user-centered design applications. This approach facilitates continuous improvement of UX quality and adapts to real user needs.

Discussion

The results of the study indicate that the Poro and Obenkyou applications offer different user experiences, with Poro achieving higher scores across all evaluated dimensions. This aligns with previous findings emphasizing the importance of user experience design in enhancing user satisfaction with mobile applications (Sabukunze & Arakaza, 2021). Poro, which integrates gamification elements, successfully creates a more engaging and motivating learning experience, contributing to its high score in the Stimulation dimension. Research by Lu *et al.* (2022) shows that perceptions of usefulness and ease of use significantly influence learning flow and user satisfaction, which may explain why Poro is more effective at capturing user attention.

Conversely, while Obenkyou also received positive ratings, it demonstrated weaknesses in the Dependability dimension, which can be attributed to its less responsive interface. Abuaddous *et al.* (2022) indicate that system reliability greatly affects user experience, suggesting that improvements in this area should be a priority for Obenkyou's developers. Furthermore, the t-test analysis confirmed significant differences between the two applications, highlighting the tangible impact of design approaches on user experience, supporting findings by Carlier *et al.* (2021) that gamification can enhance user engagement in educational applications. Therefore, recommendations for application development should focus on improving efficiency and reliability while maintaining engaging elements that have proven effective in enhancing user experience.

4. Conclusion

The results of this study indicate that the Poro application received favorable feedback from users across all dimensions, achieving its highest score in the Stimulation aspect, while Efficiency received the lowest rating. In contrast, the Obenkyou app also garnered positive evaluations across all dimensions, with the highest score on Novelty and the lowest on Dependability. The t-test analysis revealed meaningful differences in user experiences between the two applications across all assessed variables, with the Poro app obtaining higher user experience scores overall compared to Obenkyou on all tested variables. Notably, the variables of Efficiency in the Poro app and Dependability in the Obenkyou app require more attention to enhance service quality and ensure reliability. Several recommendations for future research have been proposed, including the integration of the UEQ method with other evaluation tools to achieve a more comprehensive and reliable analysis, which can help researchers identify specific areas needing improvement more effectively.

Additionally, when gathering data through digital surveys, it is essential for researchers to provide thorough explanations for each question and clear, easy-to-follow instructions to reduce potential confusion among respondents and enhance the quality and participation of responses. Furthermore, in app development, it is crucial to examine the technical performance of the application during the development phase to ensure effective operation and the generation of constructive user feedback. While this study presents relevant findings, future research involving a more diverse user base and varied evaluation methods could further enrich the understanding of user experience in similar contexts. Implementing these suggestions is expected to support future studies in gaining deeper insights and enhancing user experiences across various technological platforms while preserving the integrity and quality of references.

5. References

- Abuaddous, H. Y., Saleh, A. M., Enaizan, O., Ghabban, F. M., & Al-Badareen, A. B. (2022). Automated user experience (UX) testing for mobile application: Strengths and limitations. *International Journal of Interactive Mobile Technologies*, 16(4), 30–45. <https://doi.org/10.3991/ijim.v16i04.26471>.
- Almasri, H., Zakuan, N., Amer, M. S., & Majid, M. R. (2021). A developed systematic literature review procedure with application in the field of digital transformation. *Studies in Applied Economics*, 39(4). <https://doi.org/10.25115/eea.v39i4.4559>.
- Anderies, A., Agustina, C., Lipiena, T., Raaziqi, A., & Gunawan, A. A. S. (2023). User experience analysis of Duolingo using user experience questionnaire. *Engineering Mathematics and Computer Science Journal*, 5(3), 155–159. <https://doi.org/10.21512/emacsjournal.v5i3.9227>.
- Carlier, S., Coppens, D., De Backere, F., & De Turk, F. (2021). Investigating the influence of personalised gamification on mobile survey user experience. *Sustainability*, 13(18), 10434. <https://doi.org/10.3390/su131810434>.
- Chigbu, U. E., Atiku, S. O., & Du Plessis, C. C. (2023). The science of literature reviews: Searching, identifying, selecting, and synthesising. *Publications*, 11(1), 2. <https://doi.org/10.3390/publications11010002>.
- Darmawan, A. K., Hamzah, M. A., Bakir, B., Walid, M., Anwari, A., & Santosa, I. (2021). Exploring usability dimension of smart regency service with Indonesian adaptation of the System Usability Scale (SUS) and User Experience Questionnaire (UEQ). In *2021 International Conference on Computer Science, Information Technology, and Electrical Engineering (ICOMITEE)* (pp. 74–79). IEEE. <https://doi.org/10.1109/ICOMITEE53461.2021.9650086>.

- Dewi, P. W. S., Dantes, G. R., & Indrawan, G. (2020, April). User experience evaluation of e-report application using cognitive walkthrough (cw), heuristic evaluation (he) and user experience questionnaire (ueq). In *Journal of Physics: Conference Series* (Vol. 1516, No. 1, p. 012024). IOP Publishing.
- Fayez, O., Ozfidan, B., & Ismail, H. (2023). The praxis of user experience (UX) in the design of undergraduate online classes: Framing the perceptions of engineering and social sciences students. *Sustainability*, 15(4), 3300. <https://doi.org/10.3390/su15043300>.
- Hussain, A., Mkpojiogu, E. O. C., & Babalola, E. T. (2020). Using mobile educational apps to foster work and play in learning: A systematic review. *International Journal of Interactive Mobile Technologies*, 14(18), 178. <https://doi.org/10.3991/ijim.v14i18.16619>.
- Kollmorgen, J., Hinderks, A., & Thomaschewski, J. (2024). Selecting the appropriate user experience questionnaire and guidance for interpretation: The UEQ family. *International Journal of Interactive Multimedia and Artificial Intelligence*, In press. <https://doi.org/10.9781/ijimai.2024.08.005>
- Kumar, B. A., & Chand, S. S. (2024). Design and validation of a usability evaluation questionnaire (UEQ) for mobile learning applications. *Interactive Technology and Smart Education*, 21(3), 426–441. <https://doi.org/10.1108/ITSE-07-2023-0122>.
- Lampropoulos, G., & Sidiropoulos, A. (2024). Impact of gamification on students' learning outcomes and academic performance: A longitudinal study comparing online, traditional, and gamified learning. *Education Sciences*, 14(4), 367. <https://doi.org/10.3390/educsci14040367>.
- Lu, A., et al. (2022). The roles of mobile app perceived usefulness and perceived ease of use in app-based Chinese and English learning flow and satisfaction. *Educational Information Technology*, 27(7), 10349–10370. <https://doi.org/10.1007/s10639-022-11036-1>.
- Mujinga, M. (2024). Online banking user experience: A user experience questionnaire (UEQ) assessment in South Africa. *Indonesian Journal of Information Systems*, 6(2), 117–129. <https://doi.org/10.24002/ijis.v6i2.8606>.
- Nakamura, W. T., et al. (2021). Are UX evaluation methods providing the same big picture? *Sensors*, 21(10), 3480. <https://doi.org/10.3390/s21103480>.
- Nasution, W. S. L., & Nusa, P. (2021). UI/UX design web-based learning application using design thinking method. *ARRUS Journal of Engineering and Technology*, 1(1), 18–27. <https://doi.org/10.35877/jetech532>.
- Noor, A., & Hadisaputro, E. L. (2022). Analisis pengalaman pengguna pada aplikasi TIX ID menggunakan metode user experience questionnaire. *Journal of Information Systems Research*, 3(4), 672–677. <https://doi.org/10.47065/josh.v3i4.1881>.
- Oktanuryansyah, M. N., & Syarief, A. (2021). Evaluasi pengalaman pembelajaran daring berbasis praktikum dengan kualitas hasil belajar mahasiswa menggunakan UEQ scales. *Journal of Indonesian Education*, 2(08), 1395–1407. <https://doi.org/10.59141/japendi.v2i08.239>.
- Pečnik, K., Juvan, Ž., Dolinar, G., & Pogačnik, M. (2025). User experience questionnaire in sign language for native users of Slovenian sign language. *Scientific Reports*, 15(1), 5802. <https://doi.org/10.1038/s41598-025-89954-6>.
- Perotti, L., Stamm, O., Dietrich, M., Buchem, I., & Müller-Werdan, U. (2024). The usability and user experience of an interactive e-learning platform to empower older adults when using electronic personal health records: An online intervention study. *Universal Access in the Information Society*. <https://doi.org/10.1007/s10209-024-01124-z>.

- Sabukunze, I. D., & Arakaza, A. (2021). User experience analysis on mobile application design using user experience questionnaire. *Indonesian Journal of Information Systems*, 4(1), 15–26. <https://doi.org/10.24002/ijis.v4i1.4646>.
- Saleh, A. M., Abuaddous, H. Y., Alansari, I. S., & Enaizan, O. (2022). The evaluation of user experience on learning management systems using UEQ. *International Journal of Emerging Technologies in Learning*, 17(7), 145–162. <https://doi.org/10.3991/ijet.v17i07.29525>.
- Santoso, H. B., Schrepp, M., Hasani, L. M., Fitriansyah, R., & Setyanto, A. (2022). The use of User Experience Questionnaire Plus (UEQ+) for cross-cultural UX research: Evaluating Zoom and Learn Quran Tajwid as online learning tools. *Heliyon*, 8(11), e11748. <https://doi.org/10.1016/j.heliyon.2022.e11748>.
- Saputra, D., & Kania, R. (2022). Designing user interface of a mobile learning application by using a design thinking approach: A case study on UNI Course. *Journal of Marketing Innovation*, 2(2). <https://doi.org/10.35313/jmi.v2i2.36>.
- Setyowati, D., Qadar, R., & Efwinda, S. (2022). Analisis motivasi siswa berdasarkan model ARCS (Attention, Relevance, Confidence, and Satisfaction) dalam pembelajaran fisika berbasis e-learning di SMA Se-Samarinda. *Journal of Physics Education Literacy*, 3(2), 116–129. <https://doi.org/10.30872/jlpf.v3i2.1044>.
- Syamsuddin, A., Togatorop, A. L., Karubaba, O. C., Sholahuddin, M. Z., & Prasetya, T. B. (2024). The influence of mobile application user experience, service quality, and social interaction on customer satisfaction: Quantitative research in the online service industry. *International Journal of Science and Society*, 6(3), 83–98. <https://doi.org/10.54783/ijisoc.v6i3.1225>.
- Yang, T., Bakar Razali, A., & Zulkifli, N. N. (2023). Optimizing user experience: Designing an engaging educational mobile application for English vocabulary knowledge and student engagement in higher education. *Educational Administration: Theory and Practice*, 30(2). <https://doi.org/10.52152/kuey.v30i2.1060>.