

Designing Interface and User Experience of Elementary School Learning Applications Using Design Thinking

*Designing Interface
and User Experience*

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ABSTRACT

Indonesia's entry into the Education 4.0 era emphasizes integrating cyber technology into learning, as reflected in the implementation of the Merdeka Curriculum, which aims to foster the Pancasila Student Profile. Despite this, low student motivation and interest, particularly in mathematics, remain key challenges. This study aims to design an interactive learning application tailored to elementary school students to address these issues. Using the Design Thinking methodology, five stages—empathize, define, ideate, prototype, and test—were employed, involving questionnaires, interviews, usability testing via Maze.co, and user experience evaluation (UEQ). The findings reveal that the application includes structured curriculum-based materials, customizable quizzes, and discussion forums. Usability testing achieved a success rate exceeding 80%, and UEQ results ranged from above average to excellent. Although the application effectively increases engagement and learning outcomes, improvements in visual elements, such as color selection and illustrations, are recommended to enhance the user experience further. This research underscores the significance of user-centered design in creating impactful educational tools that motivate and engage students while supporting educators' instructional goals.

Keywords: Design Thinking, Education 4.0., Elementary School, Learning Applications, User Experience

ABSTRAK

Masuknya Indonesia ke era Pendidikan 4.0 menekankan pada pengintegrasian teknologi siber ke dalam pembelajaran, sebagaimana tercermin dalam penerapan Kurikulum Merdeka yang bertujuan untuk membina Profil Pelajar Pancasila. Meskipun demikian, motivasi dan minat siswa yang rendah, khususnya dalam bidang matematika, tetap menjadi tantangan utama. Penelitian ini bertujuan untuk merancang aplikasi pembelajaran interaktif yang disesuaikan untuk siswa sekolah dasar guna mengatasi masalah tersebut. Dengan menggunakan metodologi Design Thinking, lima tahap—empati, definisi, ide, prototipe, dan pengujian—diterapkan, yang melibatkan kuesioner, wawancara, pengujian kegunaan melalui Maze.co, dan evaluasi pengalaman pengguna (UEQ). Temuan penelitian mengungkapkan bahwa aplikasi tersebut mencakup materi berbasis kurikulum terstruktur, kuis yang dapat disesuaikan, dan forum diskusi. Pengujian kegunaan mencapai tingkat keberhasilan melebihi 80%, dan hasil UEQ berkisar dari di atas rata-rata hingga sangat baik. Meskipun aplikasi tersebut secara efektif meningkatkan keterlibatan dan hasil pembelajaran, peningkatan elemen visual, seperti pemilihan warna dan ilustrasi, direkomendasikan untuk lebih meningkatkan pengalaman pengguna. Penelitian ini menggarisbawahi pentingnya desain yang berpusat pada pengguna dalam menciptakan alat

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Kata kunci: *Design Thinking, Pendidikan 4.0., Sekolah Dasar, Aplikasi Pembelajaran, Pengalaman Pengguna*

INTRODUCTION

Indonesia has entered the Industry 4.0 era which is marked by the integration of sophisticated automation technology with cyber technology (Astuti & Stiawati, 2023). The term industry 4.0 includes several concepts, such as smart factories, cyber-physical systems, and self-organization (Moraes et al., 2023). Likewise, Education 4.0 is described as a way to integrate cyber technology into learning (Puspitasari, 2022). One of the main technologies related to Education 4.0 is the development of technology platforms, collaboration of innovation system components, open educational resources, and the introduction of modern learning and teaching strategies (Akimov et al., 2023). Basic education is a level that is able to support further education, namely secondary and higher education. Basic education has a function in instilling values, attitudes and a sense of beauty, a foundation of knowledge, skills and competencies in reading, writing and arithmetic so that students can continue their studies to a higher level (Syaodih, 2009). To achieve this, it is necessary to use the right learning theory, one of which is constructivist theory. Proper management can increase existing resources (Pertiwi, 2023; Mawardi & Cahyadi, 2024).

Constructivist theory was developed by Jean Piaget who said that knowledge is the result of a person's cognitive construction or training through activities or actions carried out. This theory emphasizes creative and constructive activities based on what is learned and requires students to be able to actively participate in the learning process so that they can create understanding or produce new ideas by demanding activities and active participation in real-life contexts, in order to encourage students to think, reflect, and demonstrate it (Anjelita & Supriyanto, 2024). Currently, education in Indonesia uses the Merdeka Curriculum. This curriculum is designed based on evaluation and study of the previous curriculum, namely the 2013 Curriculum and the Emergency Curriculum. The main objective of the Independent Curriculum is to create meaningful and effective learning to improve faith, piety, and noble morals, as well as develop students' creativity, feelings, and intentions as learners who display the characteristics of Pancasila and are manifested in the Pancasila Student Profile (Wahyudin et al., 2024). On the other hand, the establishment of the Independent Curriculum aims to return the management of education to schools and local governments through flexibility in designing, implementing, and evaluating education programs (Wahyuningsih, 2021). According to Ardianti & Amalia (2022), this independent concept is in line with the principle of Ki Hajar Dewantara which emphasizes free learning so that students can learn independently and creatively. Therefore, this curriculum is carried out with consideration of philosophical, sociological, psychopedagogical, historical, and legal foundations.

In the research of Nurunnajja et al. (2023), it was shown that there was an increase in the average mid-term exam score in one of the elementary schools in Porwosari which was the result of implementing the Merdeka Curriculum. In the research of Agustin (2024), which evaluated the curriculum using the CIPP Model (Context, Input, Process, & Product), it was shown that the process indicators needed to be improved, namely the lack of variation in learning methods. Thus, innovation in learning methods for student activity in the learning process and increasing comprehensive skills is needed to perfect the implementation of the curriculum. Efforts to create a successful student learning process are influenced by two main factors, namely student interest and motivation. Interest functions as the initial impetus that makes students interested in learning certain material, while motivation encourages students to continue trying to achieve their learning goals. The main factors that influence student motivation come from themselves

and their parents. This is because parents who play a role in their children's development will increase students' motivation to learn according to Dinar in (Budi et al., 2024).

As an initial step in identifying problems, the author conducted a pre-survey related to the implementation and evaluation of the use of learning media in elementary schools. The instruments used were questionnaires and interviews collected from two groups of respondents, namely teachers as educators and elementary school students as learners. These two tools allow the author to obtain structured data both quantitatively and qualitatively. Based on an online questionnaire of 38 teacher respondents and 28 elementary school student respondents, it shows that the subject that is less popular is mathematics with the main cause being the difficulty of understanding the material. That way, students often ask for help from friends who understand mathematics better or hold additional guidance "1 on 1" with the relevant teacher. On the other hand, Kahoot! is one of the learning applications that is currently often used, although there are obstacles to its use. According to Wang & Tahir (2020), students experience pressure when working on questions due to the short time to complete them, fear of losing, and difficulty catching up if the answer is wrong. According to Bhuana (2023), the disadvantage of Kahoot! is the absence of a discussion column that helps explain to students about wrong answers. Therefore, the author designed a learning application.

Learning applications are designed with two main aspects, namely User Interface (UI) and User Experience (UX). User interface is the process used by designers to build interfaces in software, with a focus on visuals or style (Foundation, 2016b). Meanwhile, user experience is the process used by designers to create products that have meaningful and relevant experiences for users (Foundation, 2016a). Based on the results of the pre-survey and several theories above, the purpose of this study is to design an interactive learning application that increases the interest and motivation of elementary school students in learning mathematics. Identifying factors that influence the effectiveness of user experience development in elementary school learning applications on students' understanding of mathematics subjects. Evaluating the results of usability and user experience tests of the prototype of the mathematics learning application developed using the design thinking method. The design of this learning application is assisted by the design thinking method. According to Severino et al. (2021), design thinking is a creative and analytical process that allows experimentation, prototyping, getting feedback, and redesigning. This method is used to produce learning intermediaries in the form of learning media that are centered on user needs. Therefore, the results of this study are in the form of a prototype design of a user interface based on an elementary school mathematics learning application which is expected to increase interest and motivation in learning mathematics lessons.

METHODS

This study uses a mixed method, namely a combination of qualitative and quantitative approaches, with the design thinking method as the main framework in the learning application design process. This method consists of five stages, namely empathize, define, ideate, prototype, and test (Plattner, 2010). The qualitative approach is used to explore user needs and problems, while the quantitative approach is applied to test the application prototype. At the empathize stage, questionnaires and interviews were conducted with elementary school teachers and students to understand user needs. The results of this stage are analyzed in the define stage, where the main problems are formulated based on previously obtained data. Furthermore, the ideate stage aims to produce various creative ideas through the brainstorming method to solve the problems that have been formulated. The results of the ideate stage are realized in the form of a prototype at the prototype stage, namely the initial design of the application designed according to these ideas. The resulting prototype is then tested at the test stage. This test uses two test tools, namely the usability test with Maze.co to assess the usability of the application, and the User Experience Questionnaire (UEQ) to measure user experience with the application. The combination of qualitative and quantitative approaches at each stage ensures that the

resulting application design is relevant to user needs and has high quality. With this method, the study was able to integrate in-depth user insights with quantitative data-based validation to produce effective and user-friendly learning applications.

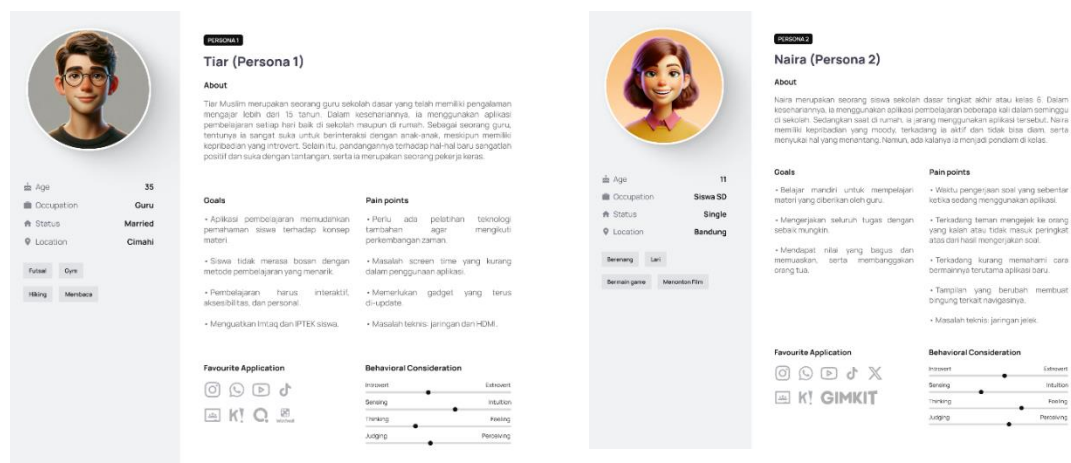
RESULTS

Pre-Survey Stage

At this stage, a learning application interface design for elementary school students will be built, starting with a pre-survey and then continuing with the design thinking method. The pre-survey activities carried out by distributing questionnaires and interviews involving educators and elementary school students showed important findings related to subjects and learning applications. The results of the pre-survey will be analyzed using the "5 why analysis". This analysis is used to explore and find the main source of problems experienced by users. Based on the results of the questionnaire and interviews, the initial problem experienced by students is a lack of interest in mathematics. The first reason for this problem is that the material is difficult, which reduces students' motivation to learn. This motivation is also influenced by the learning method used which is less interesting, so it requires a learning application as an interactive media related to technology. The use of this application can provide interesting and balanced teaching between material and quizzes in learning. Based on the analysis, it was concluded that the main problem faced by students was a less interactive learning approach and learning media that did not meet the needs, especially in mathematics, which requires deeper reasoning.

Tahap Design Thinking

Empathize is the first stage in the design thinking method, which is the stage of collecting data by understanding the target users of the learning application using a questionnaire. The results of the questionnaire are visualized in the form of user personas, empathy maps, and user journey maps. The creation of this user persona aims to describe the persona profile, namely teachers and students as representations of application users, which include the background, goals and challenges of using the learning application. The visualization of the user persona is shown in Figure 1.

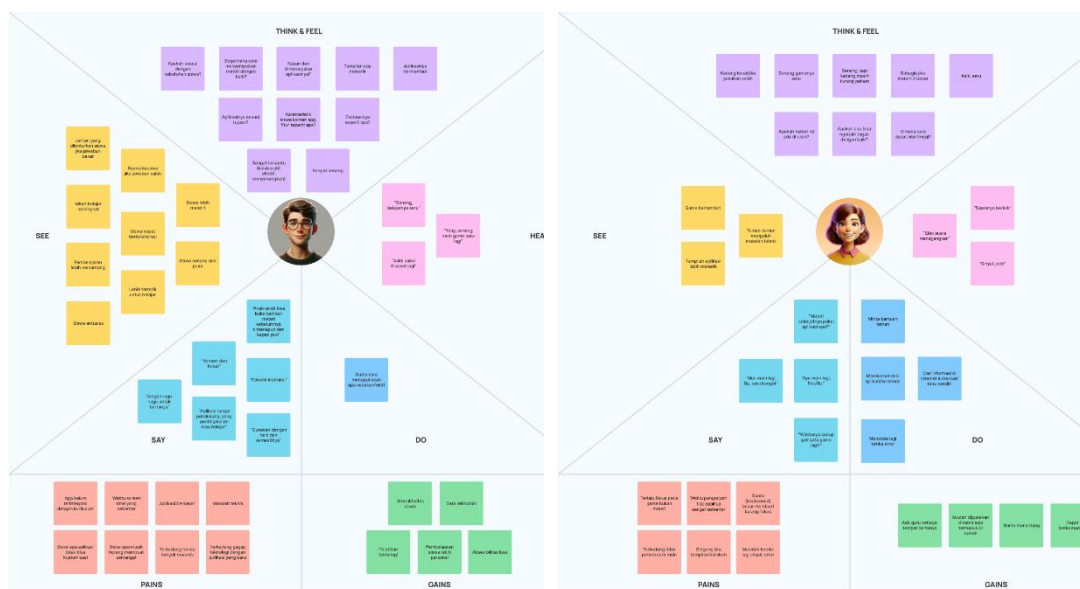


Source: Author

Figure 1. User Persona

Based on Figure 1, Tiar's main goal - represented as Persona 1 - to become a teacher who uses learning applications is to make it easier for students to understand the concepts of the material given to them. Learning applications can be a medium that helps students to continue to be enthusiastic about learning new materials, so that it can reduce their level of boredom. In addition, Persona 1 believes that the use of applications can improve students' science and technology which is very useful for the future of students. Thus, it

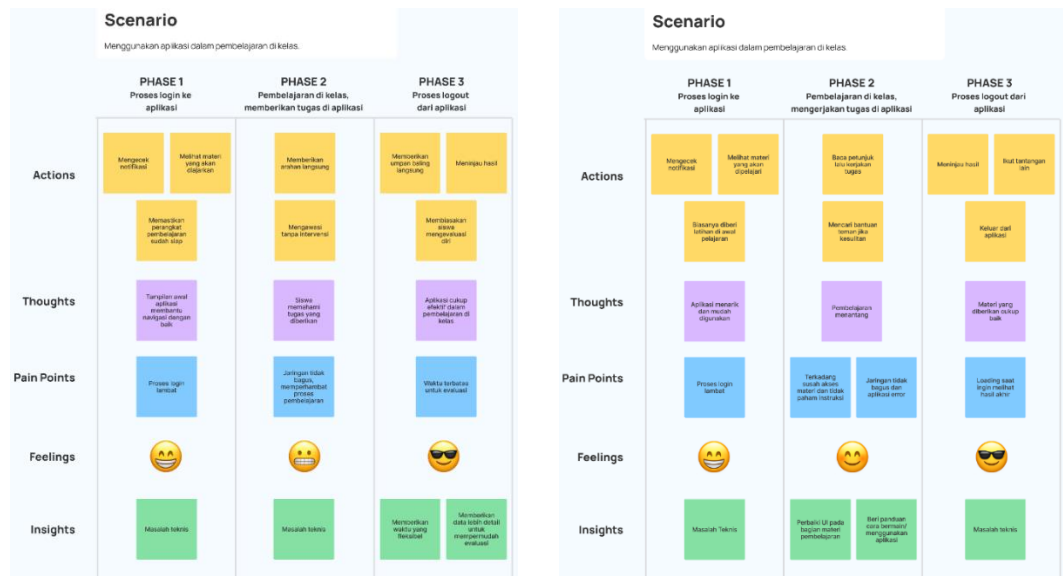
can be concluded that this learning can be used as an interactive learning method, has wider accessibility, and personal learning for each student. Based on Figure 1, Naira's goal - a final year elementary school student or grade 6 who represents Persona 2 - in using learning applications is to study independently and study the material given by her teacher. However, most of the applications used focus on practice. Thus, the application is more often used to do all the assignments by Persona 2 as well as possible. By doing all the assignments given to Persona 2, of course she hopes that she will get good grades and can make her parents proud.



Source: Author

Figure 2. Empathy Map of Teachers and Students

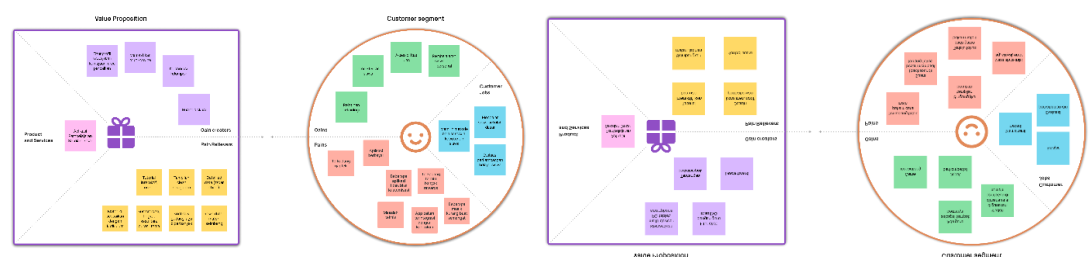
Based on Figure 2, it is the Empathy Map Stage which provides a better understanding of the emotions, feelings, statements, and actions of teachers and students in using the application. From the picture, it can be concluded that the learning application provides benefits to teachers and students that help the learning process more interesting. The use of this media also creates a feeling of pleasure from both personas. However, there are some pains experienced by each persona. The obstacles experienced by teachers are materials that have not been integrated with the curriculum and the short evaluation time. Another obstacle experienced is the lack of customization and some teachers experience technological stuttering. Meanwhile, the obstacle experienced by students is the focus of the application which does not prioritize the material. On the other hand, students also complain about the very short time to work on the practice questions. However, students are still happy because they can learn wrapped in challenging games.



Source: Author

Figure 3. User Journey Map for Teachers and Students

Based on Figure 3 User Journey Map (UJM), this section will show how teachers and students experience when using the application consisting of three stages, namely the stage of entering the application, the stage when using it, and ending with the stage of exiting the application. Overall, the process of using the learning application through the three phases above shows good potential in the effectiveness of student learning. Although there are still technical problems and obstacles during the evaluation that are not yet efficient. One step that can be taken to overcome this obstacle is to provide more detailed learning outcome data in the form of radar charts or other data to speed up the evaluation process.



Source: Author

Figure 4. Sitemap

Based on Figure 4, the second stage in design thinking is define, where the activity is to formulate the main problems and needs of the two personas obtained from the previous stage. These problems will be visualized in the form of Value Proposition Canvas (VPC), Point of View (PoV), and How Might We (HMW). The creation of this VPC is used to understand the persona in order to produce a product that can overcome the obstacles faced and improve what is already good in the product. From the picture, it can be concluded that the learning application is liked by both groups because it can facilitate the learning process and produce interesting learning. On the other hand, the main obstacle experienced by teachers is the evaluation time and materials that have not been integrated with the curriculum. Meanwhile, the obstacle experienced by students is that the application that has been used is not balanced between the material and the quizzes displayed and the quiz time is short. Based on VPC data, several PoVs and HMWs are

formulated. PoV aims to understand each other's roles and their needs for the development of learning applications. Meanwhile, HMW is used to explore creative solutions and the process of generating design ideas from the learning application. The next stage is ideate, which is the development of learning applications and aims to formulate creative idea solutions based on the previous stage. At this stage, a list of content requirements will be created where the ideation results are visualized in the form of a site map and user flow. The creation of a list of content requirements aims to summarize all user needs and descriptions of their features. Writing PoV and HMW follows the following structure.

PoV: (*User persona*) needs to (*User's Needs*) because (*Insight*).

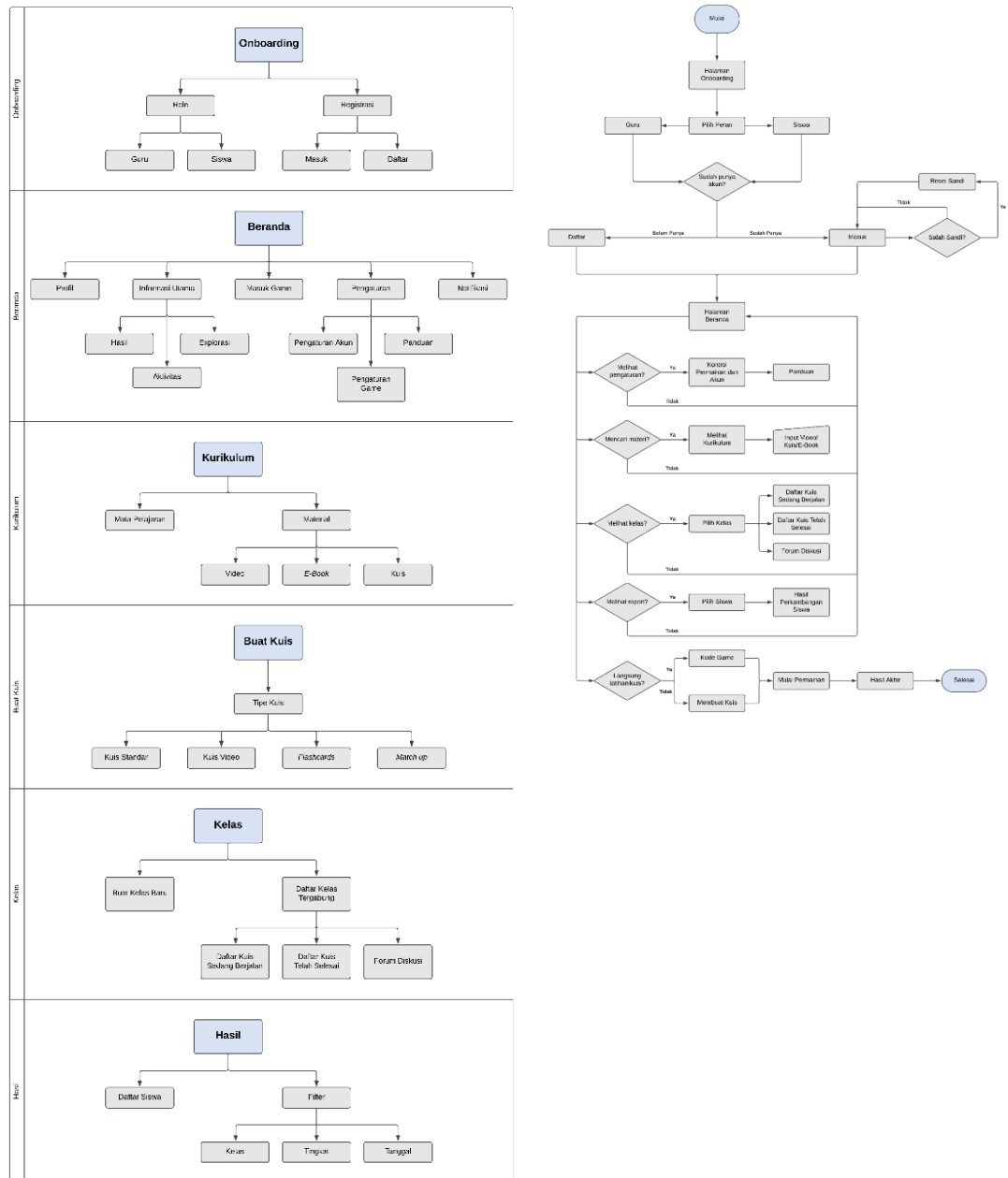
HMW: HMW (*Action*) for (*User persona*) so that (*Desired outcome*).

Table 1. PoV, HMW, User Need and Content Requirement Teachers and Students

	PoV	HMW	User Need	Content Requirement
Teacher	Elementary teachers need training data to easily monitor student progress because of incomplete progress reports.	HMW provides concise, informative, and detailed visual dashboards such as radar charts for elementary teachers to easily monitor student learning outcomes.	Short evaluation time	Learning outcomes in the form of radar charts
	Elementary teachers need integration of digital learning with the curriculum as current apps are often not in line with current learning standards.	HMW provides a material customization feature for primary school teachers so that they can adapt the content to the curriculum used.	Integration of the app with the curriculum	Material display is adjusted to the curriculum
	Elementary teachers need apps that can support student collaboration because collaborative learning can improve student engagement and learning outcomes.	HMW adds an online discussion feature for elementary teachers to allow students to learn collaboratively.	Collaboration between teachers and students	Discussion forum
Student	Elementary students need situations that keep them focused on the subject matter as the game elements in apps can sometimes draw their attention too much.	HMW integrates balanced gamification for elementary students to keep them interested in learning and exercises/quizzes without neglecting the learning material.	The focus of the app is not only on the game	Interactive learning material
	Elementary students need more time to work on exercises/quizzes because they have difficulty working on problems that require deeper reasoning, especially when doing math.	HMW provides flexible time in doing exercises/quizzes for elementary students so that they can work on questions calmly and stay focused.	Additional time during quizzes	Flexible quiz timing

Source: Author

Based on Table 1, it can be seen that there are basic needs from teachers and students to create an optimal learning experience. These needs are the basis for developing features that are in line with users. The table also displays several main features classified by persona. These features are designed according to the identified user needs. User needs data is obtained from the results of the analysis in the previous stage.



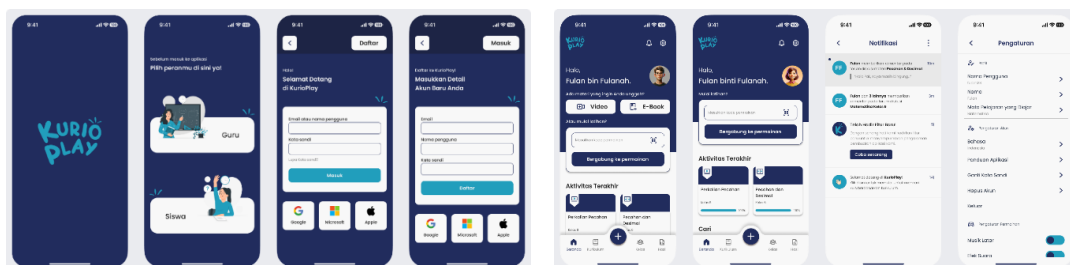
Source: Author

Figure 5. Site Map and User Flow

The creation of a site map that aims to show a systematic and comprehensive information structure, including features that will be displayed on the application page. The creation of this site map will be divided into 6 parts consisting of onboarding, homepage, curriculum, create quizzes, classes, and results. These six parts consist of the first part that appears before entering the main page of the application, namely onboarding, and the second part as the 5 main pages which are adjusted to the design of the bottom navigation bar in the application. The next is the creation of a user flow that aims to provide an overview of the flow that will be passed by users when using the learning application. This application flow starts from selecting a role on the onboarding page, logging in or registering an account, then the home page appears. Users can access a collection of materials on the curriculum icon, create new quizzes with the plus (+) icon, access discussion forums on the class icon, and access student learning outcomes on the results icon, all of which are located on the bottom navigation bar.

Prototype Stage

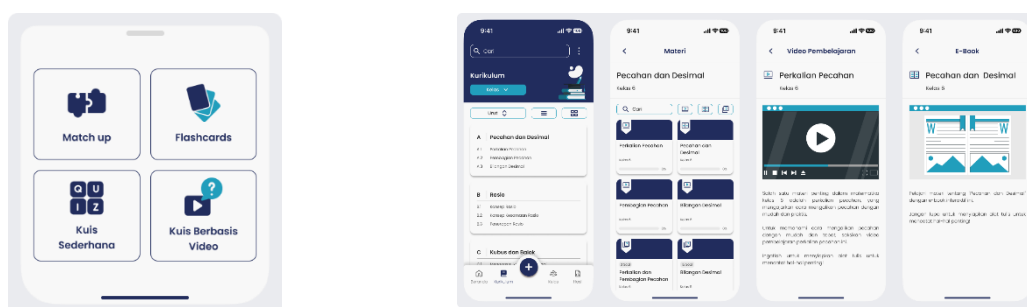
The fourth stage in design thinking is prototyping, which focuses on designing the interface design of the learning application. This process uses the Figma tool to compile the design elements needed in the application's user interface. The prototype design is designed according to user needs and refers to the application's site map structure. The site map is divided into six main sections to facilitate navigation and use. With this approach, the prototype reflects the overall functionality and aesthetics of the application.



Source: Author

Figure 6. Prototype: Onboarding and homepage

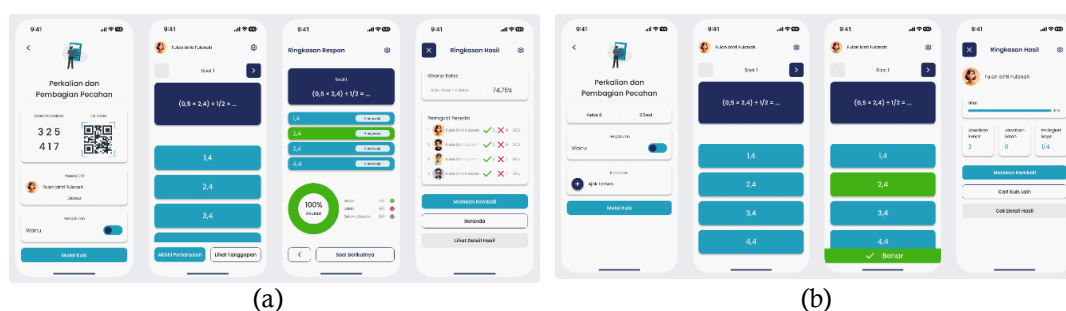
Figure 6 shows the design of the onboarding page, which is where users first choose their role. Then, users can log in to the application by registering if they do not have an account. The image above shows the design of the home page or main page of the application. The home page provides the main features, such as uploading materials, entering the game, and a collection of materials based on the last activity. There is a slight difference on the home page for students, which is the absence of the upload material feature.



Source: Author

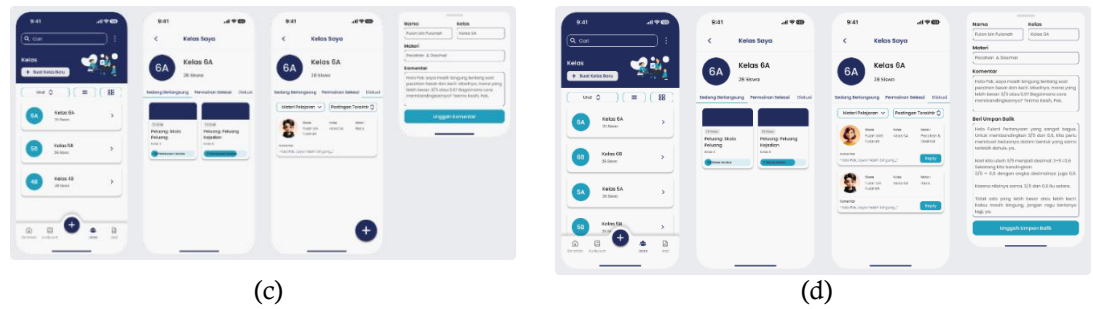
Figure 7. Prototype: Create quiz and Prototype: Curriculum

Figure 7 shows the design of the quiz page. Here, users can access quick features in creating interactive quizzes. There are several variations of quizzes provided, such as standard quizzes, video quizzes, flashcards, and match ups. The Curriculum Prototype displays the design of the curriculum page which is a collection of materials that are grouped and adjusted to the curriculum. Teachers can upload and manage materials in various formats such as videos, e-books, and quizzes.



(a)

(b)

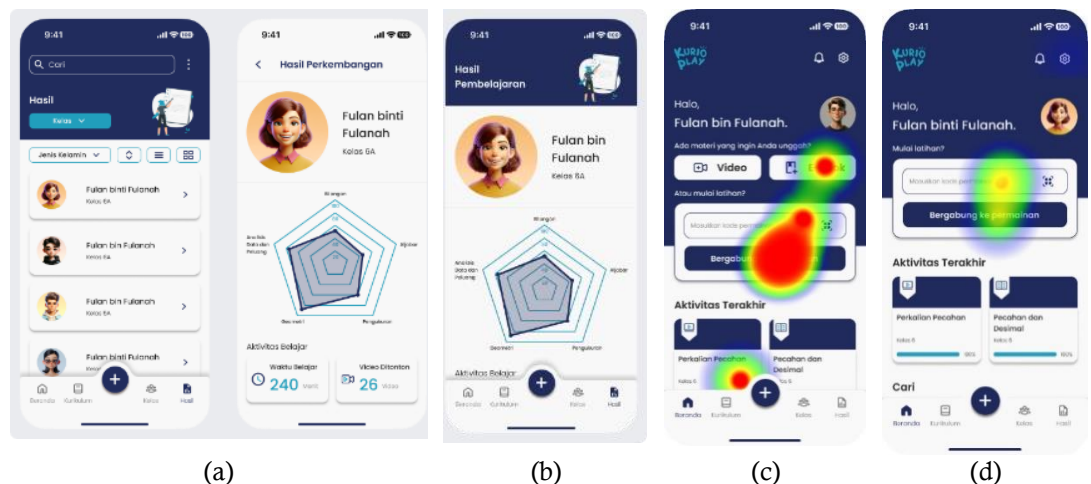


Source: Author

Figure 8. (a) Prototype: Quiz–Teacher, (b) Prototype: Quiz–Student, (c) Prototype: Class–Teacher, and (d) Prototype: Class–Student

Based on Figure 8, there is a time setting before entering the quiz. This is one of the features provided to overcome student constraints related to quiz time so that students can work on the quiz more calmly and not in a hurry. Figure 8 shows the design of the class page. Here, users can see ongoing quizzes, completed quizzes, and discussion forums. Students can ask and discuss with teachers regarding material or anything that requires teacher direction on this page.

The last stage of the design thinking method, test, aims to ensure that the application prototype meets user needs. This test involved 23 respondents consisting of 8 teachers and 15 elementary school students. This process is carried out by testing usability which focuses on testing the success of respondents in completing the given mission. In addition, testing was carried out using the User Experience Questionnaire (UEQ) which was used to evaluate the experience felt by users when working on the mission. The usability testing process is carried out by providing four tasks/missions that will be tested by the user. The missions consist of: 1) Exploration of materials (videos, e-books, and quizzes) according to the curriculum, 2) Exploration of quizzes, 3) Exploration of discussion forums, and 4) Exploration of development results. Based on the test results using Maze.co's assistance, the success rate in completing the four missions has been above 80% (First mission = 82.6%, second mission = 86.4%, third mission = 94.4%, and fourth mission = 100%). Overall, the missions completed by teachers and students are in accordance with the mission guidelines provided.



Source: Author

Figure 9. (a) Prototype: Results–Teacher; (b) Results–Student; (c) Heatmap of Second Mission Unfinished–Teacher; (d) Third Mission Unfinished–Student (right)

Figure 9 shows the design of the results page which is where users can see the results of student learning progress and this is where the radar chart data is located. There is a slight difference on the results page for teachers, where teachers must first select students before accessing their learning progress results. Based on Figure 9, the mission that was

not completed by the teacher occurred when working on the first mission. The steps taken by the teacher were to click the add (material) e-book button and click the "join the game" button while the guidance provided was an exploration of the collection of materials on the curriculum page. On the other hand, the mission that was not completed by the student occurred when working on the second mission, namely by clicking the "join the game" button. The guidance given to students was not to enter a new quiz room but to explore the quizzes that had been provided in the application. In a "real" application, this flow is not a wrong step. However, the author did not provide an additional page when the user clicked "enter game code" which hampered the process of completing this mission. The usability testing that has been carried out will be evaluated regarding the user experience using this tool, UEQ. There are 26 opinion scale-based question items (1-7) which are grouped into six main scales of Attractiveness, Perspicuity, Efficiency, Deponability, Stimulation, and Novelty. The UEQ results are in the form of mean values.

Tabel 2. UEQ *Items Indonesian version*

Application Source	Scale	Mean	Comparisson to benchmark
Teacher	Attraction	2.13	Excellent
	Clarity	1.91	Good
	Efficiency	1.94	Excellent
	Accuracy	1.75	Excellent
	Stimulation	2.09	Excellent
	Novelty	1.72	Excellent
Student	Attraction	1.199	Excellent
	Clarity	1.60	Above Average
	Efficiency	1.83	Good
	Accuracy	1.87	Excellent
	Stimulation	2.10	Excellent
	Novelty	1.32	Good

Source: Author

Based on table 2, the mean value according to both teachers and students is above 1.3. With this value, it shows that the six aspects of the scale (attractiveness, clarity, efficiency, accuracy, stimulation, and novelty) tested are in the categories "above average", "good", and "excellent". This application has met user needs. However, there are some improvements that need to be considered based on user feedback. One of them is the selection of application colors that need to be adjusted to current trends. This change is expected to improve the overall user experience. An attractive appearance can foster enthusiasm for learning (Wafa & Chamariyah, 2024; Izzetillah et al., 2024).

This designed learning application has several advantages. The main feature provided is a collection of materials and exercises/quizzes that are grouped according to the curriculum so that they are more organized. Organized learning makes the material easier to understand (Magdalena et al., 2020; Manutilaa et al., 2024; Hidayat et al., 2025). In addition, this application also provides a balance between providing diverse materials (video and e-book based) with the provision of various quizzes that are useful for providing opportunities for students to learn independently so that their focus is not only on the game. The combination of materials and quizzes in this application is also a factor that is liked by one of the teachers. Another feature provided by the application is a more detailed development result by providing a radar chart. This is an advantage that can help teachers evaluate students quickly and efficiently.

Based on a series of stages that have been passed, several factors were obtained that influence the effectiveness of the learning application experience. One of the main factors is a feature that is tailored to user needs where the user is positioned as the center of the design or user-centered. In addition, the flexibility of the quiz time balanced with attractive visual elements is a factor that greatly influences students to create a calmer and more interesting atmosphere when working on exercises/quizzes. These positive user emotions are what need to be considered in the design, such as providing comfort in using the application. The effectiveness of the experience in learning applications is greatly

influenced by user-centered design (Schmidt et al., 2020). In maintaining the emotional character, it needs to be equipped with good navigation so that users get convenience in accessing learning applications. Therefore, this learning application is expected to be able to handle student learning challenges based on the features that have been provided.

CONCLUSION

The design of this learning application began with a pre-survey to determine the difficulties experienced by elementary school teachers and students regarding the learning methods currently used. This stage was carried out by providing questionnaires and interviews to two groups of users, namely teachers and students. The results of the pre-survey obtained were that the learning approach was still less interactive and the learning media (applications) were still less effective, especially in mathematics subjects that require deeper reasoning. In the design process, the design thinking approach was used as a guide for the stages consisting of five stages, namely empathize, define, ideate, prototype, and test. At the empathize stage, research was conducted on both groups of users by distributing questionnaires and interviews which resulted in user personas, empathy maps, and User Journey Maps (UJM). Then at the define stage, an analysis was carried out on the data obtained in the previous stage to produce the Value Proposition Canvas (VPC), Point of View (PoV), and How Might We (HMW) to find out what needs to be considered by users. The next stage, ideate, brainstorming was carried out to produce ideas and design concepts for the learning application interface. At the prototype stage, the activity carried out was to visualize the results of the ideation carried out in the previous stage according to user needs. The final stage, testing, carried out usability and UEQ testing on 23 respondents consisting of 8 teachers and 15 elementary school students with assistance. The conclusion of the study shows that the interactive learning application is designed with relevant features to increase user interest and motivation. Features such as structured materials according to the curriculum are useful for teachers, while attractive illustrations attract students. Discussion forums and learning outcomes support collaborative interaction and motivation. The effectiveness of the application is influenced by the suitability of features, flexibility of quiz time, attractive elements, emotional character of users, and ease of access. Usability and user experience testing showed the success of the application prototype, with a mission success rate above 80% and a UEQ score in the above average to excellent category. However, improvements are needed, including adjusting the application color to trends and adding illustrations to the interface to improve the overall user experience.

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REFERENCES

- [1] Agustin, R. (2024). Evaluasi kurikulum merdeka menggunakan model cipp pada sekolah dasar. *Cendekia Pendidikan*, 3(1), 19-29.
- [2] Akimov, N., Kurmanov, N., Uskelenova, A., Aidargaliyeva, N., Mukhiyayeva, D., Rakhimova, S., Raimbekov, B., & Utegenova, Z. (2023). Components of education 4.0 in open innovation competence frameworks: Systematic review. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(2), 100037.
- [3] Anjelita, K., & Supriyanto, A. (2024). Teori belajar konstruktivistik dan implikasinya di sekolah dasar. *Jurnal Citra Pendidikan Anak*, 3(1), 916-922.
- [4] Ardianti, Y., & Amalia, N. (2022). Kurikulum merdeka: Pemaknaan merdeka dalam perencanaan pembelajaran di sekolah dasar. *Jurnal Penelitian Dan Pengembangan Pendidikan*, 6(3), 399-407.

- [5] Astuti, I. I., & Stiawati, T. (2023). Kebijakan making indonesia 4.0 dalam upaya meningkatkan kualitas sumber daya manusia (SDM) yang kompeten. *Jurnal Ilmiah Manajemen Muhammadiyah Aceh*, 13(2), 118-126.
- [6] Bhuana, G. P. (2022). The benefits and drawbacks of kahoot: studentsâ€™ perspective. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature*, 10(2), 2224-2232.
- [7] Budi, N. I. S., Pratiwi, I. A., & Riswari, L. A. (2024). Minat dan motivasi belajar pada mata pelajaran matematika siswa sekolah dasar. *Jurnal Papeda; Vol*, 6(2).
- [8] Foundation, Interaction Design. (2016a, June 1). What is Mobile User Experience (UX) Design?. Interaction Design Foundation - IxDF. Available at: <https://www.interaction-design.org/literature/topics/mobile-ux-design>
- [9] Foundation, Interaction Design. (2016b, June 2). What is User Interface (UI) Design?. Interaction Design Foundation - IxDF. <https://www.interaction-design.org/literature/topics/ui-design>
- [10] Hidayat, D. N., Restiandi, A., & Sukresna, I. M. (2025). Designing an optimal education and training model for relationship managers in the digital era. *Research Horizon*, 5(1), 79-94.
- [11] Izzetillah, I., Ghafur, A., & Arifin, M. S. (2024). Implementation of islamic boarding school cooperative management in forming the entrepreneurial spirit of santri. *Jurnal Ilmiah Manajemen Kesatuan*, 12(2), 355-364.
- [12] Magdalena, I., Sundari, T., Nurkamilah, S., Nasrullah, N., & Amalia, D. A. (2020). Analisis bahan ajar. *Nusantara*, 2(2), 311-326.
- [13] Manutilaa, K. C., Risambessy, A., & Leuhery, F. (2024). The effect of work motivation, education and training on employee performance. *Jurnal Ilmiah Manajemen Kesatuan*, 12(5), 2051-2062.
- [14] Mawardi, M. I., & Cahyadi, N. (2024). Strategy for improving human resources quality through training and brainstorming. *Jurnal Ilmiah Manajemen Kesatuan*, 12(6), 2629-2636.
- [15] Moraes, E. B., Kipper, L. M., Hackenhaar Kellermann, A. C., Austria, L., Leivas, P., Moraes, J. A. R., & Witczak, M. (2023). Integration of Industry 4.0 technologies with Education 4.0: advantages for improvements in learning. *Interactive Technology and Smart Education*, 20(2), 271-287.
- [16] Nurunnajja, D. N. D., Rahmawati, A. R. A. P. A., Putri, A., Wahyu, M. W. N. H. M., Hanifah, N., Ihsan, A. I. A., & Amaliyah, F. A. F. (2023). Pengaruh kurikulum merdeka terhadap hasil belajar matematika siswa kelas 4 di SD 1 purwosari. *Jurnal PGSD Musi*, 6(2), 52-65.
- [17] Pertiwi, T. (2023). Implementation of human resource management strategy in improving organizational performance. *Jurnal Ilmiah Manajemen Kesatuan*, 11(3).
- [18] Plattner, H. (2013). An introduction to design thinking. *Institute of Design at Stanford*, 1-15.
- [19] Puspitasari, C. (2022). Pendidikan 4.0. Binus University. Available at: <https://binus.ac.id/malang/2022/09/pendidikan-4-0/>
- [20] Schmidt, M., Earnshaw, Y., Tawfik, A. A., & Jahnke, I. (2020). Methods of user centered design and evaluation for learning designers. *Learner and user experience research*, 5(2), 1-129.
- [21] Severino, L., Petrovich, M., Mercanti-Anthony, S., & Fischer, S. (2021). Using a design thinking approach for an asynchronous learning platform during COVID-19. *IAFOR Journal of Education*, 9(2), 145-162.
- [22] Syaodih, E. (2009). Evaluasi kurikulum pendidikan dasar: Satu Usulan. *Inovasi Kurikulum*, 6(2), 54-73.
- [23] Wafa, M. A., & Chamariyah, C. (2024). The effectiveness of communication strategies in learning. *Jurnal Ilmiah Akuntansi Kesatuan*, 12(5), 713-722.
- [24] Wahyudin, D., Subkhan, E., Malik, A., Hakim, M. A., Sudiapermana, E., Alhapip, L., Anggraena, Y., Maisura, R., Amalia, N. R. A. S., Solihin, L., Ali, N. B. V., & Krisna, F. N. (2024). Kajian akademik kurikulum merdeka. *Jakarta: Pusat Kurikulum dan Pembelajaran, Badan Standar, Kurikulum, dan Asesmen Pendidikan, Kementerian Pendidikan, Kebudayaan, Riset dan Teknologi*.
- [25] Wahyuningsih, S. (2021). Modul literasi digital di sekolah dasar. *Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi*, 1-22.
- [26] Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning--A literature review. *Computers & Education*, 149, 103818.

