

Implementation of UCD with a kanban board to build an interaction design for an animal recognition application

Renna Yanwastika Ariyana¹, Erna Kumalasari Nurnawati², Muhammad Rizqy Ath-Thaariq³, Putu Widi Wahyudi⁴

^{1, 2, 3, 4}Department of Informatika Engineering, Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia

Article Info

Article history:

Received November 30, 2023

Revised December 11, 2023

Accepted December 13, 2023

Keywords:

UCD

Kanban boards

Animal

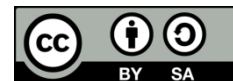
Child

Interactive media

ABSTRACT

Studying the types of animals is one way to expand knowledge about living creatures on the Earth. By introducing types of animals, especially children, it will help increase emotional intelligence, creativity, and imagination of living creatures as a basis for understanding the diversity of creatures on earth. Every child certainly has different abilities and development; in general children will experience significant progress between the ages of 3 and 6 years, so at this age it is very appropriate to introduce types of animals packaged in interactive multimedia as a medium for learning. Providing knowledge about types of animals will expand knowledge about nature and build emotional intelligence and cognitive abilities that are important in their growth. In this research, an application for recognizing animals for children will be created that implements the User-Centered Design (UCD) method with a kanban board, which is an alternative development approach that focuses on the needs and preferences of users at each stage of development, so that it is hoped that the application being developed will meet their desires and needs. user. The final result of this research is an animal recognition application, which implements the UCD method in UI/UX development and the Kanban framework in teamwork processes.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Corresponding Author:

Renna Yanwastika Ariyana,
Department of Informatika Engineering,
Institut Sains & Teknologi AKPRIND Yogyakarta,
Jl. Kalisahak No. 28, Komplek Balapan, Yogyakarta, Indonesia.
Email: renna@akprind.ac.id
<https://doi.org/10.52465/joscecx.v4i4.263>

1. INTRODUCTION

The development of kindergarten age children is generally between 3 and 6 years old, where at this age individual development will experience rapid progress in various aspects, including social, cognitive, motor, and emotional. At this stage, children will begin to develop the ability to think logically, solve simple problems, and expand their vocabulary to make fluent sentences that can be understood by the person they are talking to [1]. Children's intelligence will certainly be different from adults [2]. At this stage, children will also develop language skills, using interrogative sentences to express feelings, and so on. However, each individual child's development will certainly be different, because each child has a unique speed and pattern of development. At this age, children will generally experience significant progress in various aspects of

development, so it is very important to provide support, stimulation, and the right environment to be able to develop optimally. According to research at the age of kindergarten, the brain development reaches 80% and another 20% will develop after early childhood up to 18 years [3].

Introducing children to different types of animals is one way to expand their knowledge of nature. By introducing types of animals, children will build emotional connections, stimulate creativity, and imagination with living creatures as a basis for understanding biodiversity and the importance of conservation. Providing knowledge of the types and names of animals means giving children the opportunity to learn and expand their knowledge about nature, as well as building emotional and cognitive abilities, which are very important in their development. The development of cognitive abilities is very important for children; this aims to develop thinking abilities so that they can process their learning outcomes so that children can find various problem solutions, develop logical abilities, as well as the ability to sort, group, and prepare the ability to think carefully [4]. Apart from that, introducing children to types of animals, especially pets and farm animals, is one way to teach them responsibility. With responsibility, children will learn that animals need attention, food, drink, shelter, and care, which of course teaches the importance of meeting the needs of living creatures.

In the 21st century, technology has become part of all humans in the world and will continue to develop in the future. In the digital era, technology-based learning is certainly very useful [5]–[8]. Creating interactive applications is one innovative way to increase children's interest and involvement in getting to know types of animals through technology. Through interactive applications, children will be able to visually see the shapes and types of animals through virtual media. Interactive applications can combine various multimedia content such as images, sound, video, animation, text. Interactive applications in the form of learning media packaged by adding elements of interactivity can create a connection between individuals and learning media, so that it will have an influence on the process of delivering the material provided [9]. The existence of interactive applications, especially applications that use artificial intelligence (AI), makes learning more efficient and interactive [10]. Interesting activities through multimedia content will certainly attract and motivate children to learn and interact with animal-related content. In addition to that, multimedia is an alternative learning media that is ready to increase insight so that you are more enthusiastic about learning [11]–[14]. Children will of course be able to see pictures, sounds, videos, and animations that describe the types and names of animals in detail. Adding sound and narration to the inclusion will certainly help to understand and enrich the child's learning experience [15]. In addition, interactive applications can provide diverse educational content such as interesting facts, habitat, food, life cycles, and behavior. Kids can learn various aspects about animals in detail through videos, texts, and fun games. Through appropriate and interesting interactive applications, children will be able to imagine animal shapes more concretely [16]. The learning process is made more interesting and enjoyable, this is due to the application of media which is used as a tool in implementing learning [11]–[14].

Using interactive applications for learning can facilitate repetition and monitoring of children's learning progress. Children can explore the content repeatedly to strengthen understanding. Apart from that, several applications also offer features for recording and monitoring children's learning progress, which allows parents or educators to see children's progress in learning and recognizing animals. Current technological advances allow interactive applications not only to be played on PCs or laptops but can now be accessed easily via mobile devices or tablets with interaction designs presented in various formats, sizes and systems [17]–[19]. Giving children the flexibility to learn about animals anytime and anywhere makes learning more fun, can be done independently and can be adapted to the child's individual needs and interests.

UI/UX prototyping designs are useful in iterative development [20]. In the development of interactive applications to recognize animal species, appropriate methods and solutions are needed. Using the User-Centered Design (UCD) method is an important approach to use. UCD is an approach that focuses on user needs and preferences at each stage of application development [21]–[23]. Using the UCD method, developers can ensure that the animal recognition application they develop meets user expectations, provides a positive user experience, and considers factors such as ease of use, user participation, and user satisfaction [24]. Using a UCD approach allows developers to conduct comprehensive user research, such as interviews and observations, to understand real user needs and preferences. By considering user input, developers can design interfaces that are easy to use, intuitive, and meet user desires. With these considerations, it certainly allows developers to create animal recognition applications that are tailored to the actual needs of users. By deeply understanding user needs and preferences, conducting comprehensive user research, and involving users in the development process, the UCD method helps create animal recognition applications that suit user needs and goals. In the development of animal applications, the UCD method not only improves the quality and

effectiveness of the application, but also ensures that the application provides real added value for users, strengthens the relationship between humans and animals, and increases the understanding of animals among users.

Applying UCD to the development of animal-type applications will certainly make it easier for developers to design application interfaces that are more intuitive, easy to use, and that consider user needs in learning and recognizing animal types. Through prototype testing and repeated iterations, developers can identify problems and errors in interface design, and fix them to create a better user experience. For example, testing a prototype of an animal recognition application could involve users selecting the interface that is easiest to understand and use. Developers can pay attention to user feedback on ease of navigation, clear layout of information, and clarity of animal images or animations. By fixing ineffective designs based on user feedback, developers can improve the quality of the app's interface so that users can easily recognize and understand the types of animals displayed. From the overall development using the UCD method for animal recognition applications, it is ensured that the focus is given to the user. By understanding user needs, designing intuitive interfaces, and iterating repeatedly based on user feedback, developers can create applications that meet user expectations, provide a positive user experience, and achieve high levels of satisfaction.

By using a Kanban board, all work will be divided into columns that represent the stages of application development, such as planning, design, development, testing and launch [25]–[27]. In several studies, the Kanban board is divided into three progress states, namely, To Do, Doing, and Done, which are made from left to right [28]. However, in several studies, the Kanban board was designed in six stages, namely issue, backlog, to do, doing, review and done [29]. Each task carried out will be represented by a card that is placed in a column according to the stage of work carried out. The team can clearly see the workflow that must be followed and identify each status through visualization on the Kanban board. In addition to that, the Kanban board facilitates information sharing, making it easier to collaborate within the team.

In developing animal type recognition applications, it allows the Kanban board to respond more quickly to changes that occur during development. This is because at any time user needs or requests can change, so the development team needs to be able to adjust priorities and work flow quickly. With Kanban, the development team can easily move cards on the board according to changes that occur. The development team can adjust priorities, add or change application features, and adjust development schedules without difficulty. In this way, the development team can easily adapt to changing user needs or requests, thus ensuring that the animal recognition application being developed remains relevant and in line with user needs. Additionally, with Kanban, development teams can also easily track performance, monitor the number of tasks completed, and identify areas for improvement.

From the explanation previously stated, the research carried out will create an animal recognition application for children that implements the UCD method using a Kanban Board with a UI/UX development approach that focuses on user needs and preferences at each stage of development carried out. The hope is that from this research, the developed application will suit children's needs in getting to know types of animals in a more interesting and interactive way by utilizing advances in digital technology in the current era. As a reference source used in previous research that has developed the UCD method and the development of the Kanban Board, namely, research conducted by [30] with the title Mobile Learning Management System Development with User-Centered Design (UCD) Using the Flutter Framework. The research carried out developed a system that supports learning management, namely in the form of a mobile-based learning management system (LMS). In this research, the Flutter framework is used to develop a system that can be used on Android and iOS operating systems. Apart from that, the UCD method is also used to develop UI/UX that is tailored to student needs. The research carried out resulted in a mobile-based LMS application that can be accessed according to the needs of students as system users. Here, the test results of the system being built show that all system functions can run according to user needs. Furthermore, research conducted by [25] entitled Implementation of the User-Centered Design (UCD) Method with the Kanban Framework in Building Interaction Design. In his research, an educational game was created for kindergarten children that could be played by kindergarten-age children. In this research, the UCD method was used to develop User Experience (UX) with a focus on involving users directly in system development which was implemented in four stages, namely, determining needs, design alternatives, creating prototypes and evaluation. Apart from that, the Kanban framework was also used as a tool to monitor work results during the research with 3 title heads, namely To Do, In Progress, and Done. From the research carried out, it was found that the test results using the SUS model reached a value of 89. In addition, the application of the Kanban framework using the UCD method can be implemented with an orderly structure. The conclusion of the research conducted shows that implementing UX using the UCD method and the Kanban framework can produce interaction designs that are easy for users to use. In addition to that, research conducted by [31] in his research entitled Development of the Ciletuh Geopark Tourism Information System Applying the User-Centered Design Method. In this research, a website-based system was developed that was used to introduce Palangpang Geopark Ciletuh Beach tourism in Sukabumi district. In its development, the UCD method was used to design the system, where the

development stages that were followed were, identifying users who would use the system, identifying user needs, designing the system, and implementing it. The implementation stage uses the PHP programming language and MySQL as a database. From the research carried out, a system was produced that can be used to make it easier for tourists to find information about the Palangpang Geopark Ciletuh Beach.

2. METHOD

Application Development Methods

The applied research method focuses on implementing the UCD method using the Kanban Board in the Animal Recognition Application for Kindergarten Children aged 3-6 years.

Designing a Kanban Framework

In the research carried out, the first stage will be to design a Kanban framework, where this framework will be used as a reference in the scheduling process during the research. In the Kanban board, several workflows will be divided in the form of columns. where each column will show a specific and structured process and activities carried out from the initial stage, which are being worked on until completion [32]. In the initial stage, three main columns will be created, namely [33]:

- 1) Not Started : contains tasks that will be carried out while the research is being carried out.
- 2) In Progress : contains tasks that are being worked on/in progress.
- 3) Done : contains tasks that have been completed.

Development Using the UCD Method

There are several general stages that are often used in developing applications using UCD, namely:

- 1) User Understanding (User Research): is the stage of conducting user research to understand the needs, goals, preferences, and challenges of potential users.
- 2) Requirements Gathering: is a method for collecting and analyzing user requirements, both in the form of functional and non-functional requirements.
- 3) Conceptual Design: this is the stage of creating a conceptual model, sketch, or rough prototype to illustrate the initial solution and communicate design ideas to users and the development team.
- 4) Interaction and Interface Design: is the stage of creating interaction design that focuses on intuitive and efficient user experience.
- 5) Development and Implementation: is the stage of development or development of products or services designed by following the principles of UCD.
- 6) Evaluation and testing: is the stage of product evaluation and testing involving representative users to measure effectiveness, efficiency, and user satisfaction with the design developed.

Data Collection Technique

The research that will be carried out will of course require a variety of data related to the types of animal, both livestock and pets, that will be entered into the application. Apart from the types of livestock and pets, there are several other supporting elements that need to be displayed in the application, including information regarding the animal's name, food, body shape, and multimedia components, which will later be included in the application in the form of text, images, audio, animation, and others. The techniques used in collecting data to develop animal recognition applications for children are as follows:

- 1) Literature study is carried out by collecting data from books and other reference sources related to the UCD and Kanban Board methods. This method is used to emphasize theory and analysis requirements to obtain data that are used in building applications.
- 2) Observations and interviews: carried out by visiting one of the kindergartens (TK) in Yogyakarta directly, as well as conducting interviews with educators, namely several teachers, to obtain the information needed to support the creation of an animal recognition application for children. Interviews are conducted to find the various functional requirements that will be used to build the application.

3. RESULTS AND DISCUSSIONS

The research carried out focuses on implementing the UCD method using the Kanban Board to develop interaction designs for animal recognition applications for children. The results obtained in building applications according to the methods that have been determined are the following:

Proses Calculation of Kanban Board and Process Board

In developing applications to recognize animals for children, the Kanban model is used, where Kanban is an application development model using simple methods that can be used in small-and large-scale projects. Therefore, the aspect that needs to be considered is determining and calculating the number of rows and columns on the Kanban board. In this research, there are 3 Kanban headers used, namely To Do, In Progress, Done. Determination is divided into two processes, namely data collection and system development. The form of the Kanban board that has been created is shown in Figure 1.

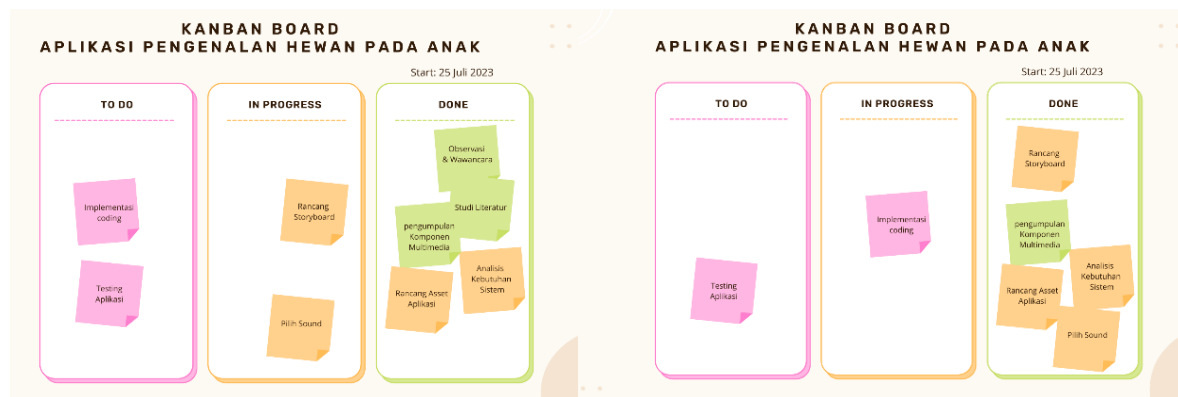


Figure 1. Kanban board application for introduction to animals for children

User Needs

When determining user needs for the interaction design of an animal recognition application for children developed using the UCD method, a direct approach was taken to the developed user so that the application was in accordance with their needs. There are several focus needs in the design and development process carried out, namely:

- 1) The design is intended for children's ages
- 2) The colors used are bright/bright colors
- 3) Navigation Placement
- 4) Ease of use
- 5) Addition of Music
- 6) Suitability of the shape of the introduced animal (according to the original shape).

Conceptual Design

At this stage, in accordance with the results of observations and interviews conducted in the field using the UCD approach, a conceptual design of the display of the system was created using a storyboard, with the aim of ensuring that the development process does not deviate from the flow that has been conceptualized. The storyboard itself functions to help developers organize each stage in application design. Using storyboards makes development easier to determine the right position and can be used as a tool to clarify the interaction design in the application being built. Several storyboards from applications to introduce animals to children using the UCD approach are shown in Figure 2 and Figure 3.

	<p>Animasi hujan turun, setelah reda muncul matahari 00:02'</p>	<p>Rancangan Halaman Menu Utama</p> <p>Terdapat <i>Button</i>:</p> <ol style="list-style-type: none"> 1. Materi 2. Video 3. Permainan 4. Profil 5. Bantuan 6. Menu 7. Keluar <p>Musik gembira</p>
--	---	---

Figure 2. Storyboard snippet of the application display in the main menu

	<p>Animasi button (setiap button akan keluar satu persatu, bergerak dari kanan ke kiri) 00:03'</p>	<p>Rancangan Halaman Menu</p> <p>Terdapat <i>Button</i>:</p> <ol style="list-style-type: none"> 1. Hewan peliharaan 2. Hewan Ternak 3. Hewan Air 4. Hewan Melata 5. Ampibi 6. Menu 7. Keluar <p>Musik gembira</p>
--	--	---

Figure 3. Application display storyboard snippets on material pages

Development and Implementation

The development and implementation stage is the stage of application creation, where at this stage an application will be built based on a storyboard that has been created by combining all the components needed in application development packaged in interactive multimedia. In the development and implementation stages of the research carried out, the ActionScrit and AdobeFlash programming languages were used as the final software.

1) Main Menu Page

Figure 3 is a display of the main menu of the animal recognition application for children. This page will later be used to connect all pages in the application, which can be accessed using the menu button that has been created. There are six menu buttons on the main page, namely, pet button, livestock button, video button,, help button, profile button and exit button.



Figure 3. Display of the main menu page

2) Material Page

Figure 4 is a display of the material used to explain the types of animals. On the menu page, there are 7 buttons, namely, pet button, livestock button, water animal button, reptile button,, amphibian button, exit button and menu button.

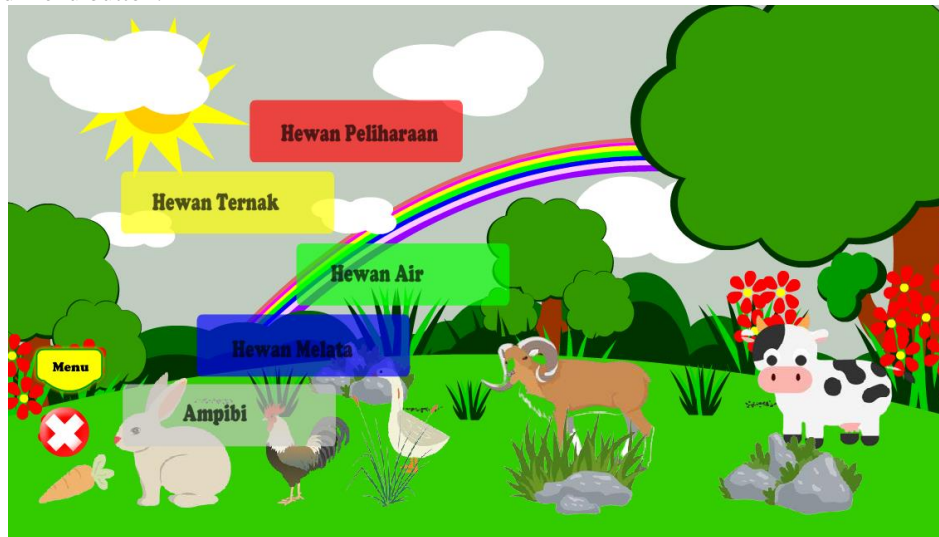


Figure 4. Material page display

Evaluation and Testing

The evaluation and testing stages are the stages used to determine the feasibility level of the application. The testing phase is carried out after the application has been developed. In this research, a black box test will be carried out which focuses on testing system functionality, specifically on application input and output to determine whether the application being built meets expectations or not. The results of black-box testing on the animal recognition application for children are shown in Table 1 below.

Table 1. Black box test results on applications

Test Scenarios	Expected Output Results	Test Results		Information
		Appropriate	Not Appropriate	
Animation in Intro	The animal animation moves alternately following the loading line, until it finishes and goes straight to the main page.	√	-	Displays a loading animation of animals coming out following a line that is carried out alternately by 3 types of animals.
Displaying the Main Menu	Displaying the main menu which contains material buttons, video buttons, game buttons, profile buttons, help	√	-	The main menu displays the main menu page of the application

	buttons, menu buttons and exit		
Displaying material pages	Displays material pages	√	Displaying material pages Displays material pages

Based on Table 1 of the system testing carried out, it was found that the results of the black box test on the animal recognition application for children contained no errors and the results of this test were also found to show that the development of the animal recognition application for children was in accordance with the user's desired interaction design.

4. CONCLUSION

Based on the results and discussion in this research, conclusions were obtained which include several important points. First, the UCD method using the Kanban Board has been implemented in an animal recognition application for children with a UI/UX development approach that focuses on user needs and preferences at each development stage, so that the developed final result of the application meets the user's desires and needs. Second, the application that was developed was tested using a black-box test with the results stating that the application that was built was in accordance with the function and storyboard design based on user needs. Apart from that, in this research, the implementation of collaborative applications was carried out by including interactive multimedia content with the developed aim of making the application developed more interesting and interactive. The application in the research being developed is only limited to presenting a simple game model in the form of guessing pictures of animals, so future developments need to add more complex games to provide challenges in evaluating children's knowledge about the types of animals that have been explained in the application.

ACKNOWLEDGEMENTS

The author would like to thank the Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM), Institut Sains & Teknologi AKPRIND Yogyakarta, which has supported and provided the opportunity to carry out the research activities that the author carried out.

REFERENCES

- [1] S. Sabaniah, D. F. Ramdhan, and S. K. Rohmah, "Peran Guru dalam Pelaksanaan Pembelajaran Jarak Jauh di Tengah Wabah Covid - 19," *Edunesia J. Ilm. Pendidik.*, vol. 2, no. 1, pp. 43–54, Jan. 2021, doi: 10.51276/edu.v2i1.77.
- [2] S. Ohlsson, R. H. Sloan, G. Turán, and A. Urasky, "Measuring an artificial intelligence system's performance on a Verbal IQ test for young children," *J. Exp. Theor. Artif. Intell.*, vol. 29, no. 4, pp. 679–693, Jul. 2017, doi: 10.1080/0952813X.2016.1213060.
- [3] L. Suryani and F. A. Setiawati, "Peran dan Kualitas Perkawinan Orang Tua terhadap Perilaku Anak Usia Dini," *J. Obs. J. Pendidik. Anak Usia Dini*, vol. 6, no. 2, pp. 977–988, Jul. 2021, doi: 10.31004/obsesi.v6i2.1561.
- [4] R. Ardiana, "Strategi Guru dalam Mengembangkan Kemampuan Kognitif Anak Usia 5-6 Tahun di Taman Kanak Kanak," *Murhum J. Pendidik. Anak Usia Dini*, vol. 3, no. 2, pp. 1–10, Aug. 2022, doi: 10.37985/murhum.v3i2.116.
- [5] N. R. Ramadhani, A. Mulyanto, and G. S. Niwanputri, "Designing Interaction and User Interface of Computational Thinking Digital Game for Children using User-Centered Design Approach," in *2020 7th International Conference on Advance Informatics: Concepts, Theory and Applications (ICAICTA)*, IEEE, Sep. 2020, pp. 1–6. doi: 10.1109/ICAICTA49861.2020.9429049.
- [6] M. Mirzoev, O. Shevchenko, and I. Dzhonmakhmadov, "Technological Efficiency of Computer Science Education Results in a Secondary School as a Factor of the Quality of Education in the Distance Learning System," in *2021 1st International Conference on Technology Enhanced Learning in Higher Education (TELE)*, IEEE, Jun. 2021, pp. 297–299. doi: 10.1109/TELE52840.2021.9482518.
- [7] E. Avdeeva, T. Averina, and N. Balashova, "Formation of a Continuous Education System in the Digital Environment," in *2023 3rd International Conference on Technology Enhanced Learning in Higher Education (TELE)*, IEEE, Jun. 2023, pp. 76–78. doi: 10.1109/TELE58910.2023.10184338.
- [8] E. V. Rezak and E. M. Vikhtenko, "Digital Technologies for Continuing Education Using Foreign Language Learning," in *2021 1st International Conference on Technology Enhanced Learning in Higher Education (TELE)*, IEEE, Jun. 2021, pp. 68–70. doi: 10.1109/TELE52840.2021.9482545.
- [9] M. Admelia, N. Farhana, S. S. Agustiana, A. I. Fitri, and L. Nurmalia, "Efektifitas penggunaan aplikasi Canva dalam pembuatan modul pembelajaran interaktif Hypercontent di Sekolah Dasar Al Ikhwan," *KACANEGARA J. Pengabd. pada Masy.*, vol. 5, no. 2, p. 177, May 2022, doi: 10.28989/kacanegara.v5i2.1087.
- [10] X. Jiang, "Design of Artificial Intelligence-based Multimedia Resource Search Service System for Preschool Education," in *2022 International Conference on Information System, Computing and Educational Technology (ICISCET)*, IEEE, May 2022,

- pp. 76–78. doi: 10.1109/ICISCET56785.2022.00027.
- [11] R. J. Jordy, H. Marcos, J. Wijaya Kusuma, D. Intan Surya Saputra, and P. Purwadi, “Game design documents for mobile elementary school mathematic educative games,” *J. Soft Comput. Explor.*, vol. 4, no. 2, May 2023, doi: 10.52465/josce.v4i2.129.
- [12] Z.-Y. Liu, Z. A. Shaikh, and F. Gazizova, “Using the Concept of Game-Based Learning in Education,” *Int. J. Emerg. Technol. Learn.*, vol. 15, no. 14, p. 53, Jul. 2020, doi: 10.3991/ijet.v15i14.14675.
- [13] N. Puspitasari and M. H. Wahyudi, “Mathematics Learning Application In The Form of Android-Based Educational Games At Pancasila 4 Pracimantoro Junior High School,” *Int. J. Comput. Inf. Syst.*, vol. 3, no. 4, pp. 163–170, 2022.
- [14] S. Reyssier, S. Hallifax, A. Serna, J.-C. Marty, S. Simonian, and E. Lavoue, “The Impact of Game Elements on Learner Motivation: Influence of Initial Motivation and Player Profile,” *IEEE Trans. Learn. Technol.*, vol. 15, no. 1, pp. 42–54, Feb. 2022, doi: 10.1109/TLT.2022.3153239.
- [15] M. Zhang and Y. Xia, “The Effective Research of Computer Multimedia Technology in Auxiliary Higher Vocational Physical Education Teaching,” in *2021 International Conference on Internet, Education and Information Technology (IEIT)*, IEEE, Apr. 2021, pp. 578–582. doi: 10.1109/IEIT53597.2021.00136.
- [16] R. S. Ritonga, Z. Syahputra, D. Arifin, and I. M. Sari, “Pengembangan Media Pembelajaran Smart Board Berbasis Augmented Reality Untuk Pengenalan Hewan Pada Anak Usia Dini,” *J. PG-PAUD Trunojoyo J. Pendidik. dan Pembelajaran Anak Usia Dini*, vol. 9, no. 1, pp. 40–46, Apr. 2022, doi: 10.21107/pgpaustrunojoyo.v9i1.13418.
- [17] G. Goel, P. Tanwar, and S. Sharma, “UI-UX Design Using User Centred Design (UCD) Method,” in *2022 International Conference on Computer Communication and Informatics (ICCCI)*, IEEE, Jan. 2022, pp. 1–8. doi: 10.1109/ICCCI54379.2022.9740997.
- [18] D. P. Kristiadi et al., “The effect of UI, UX and GX on video games,” in *2017 IEEE International Conference on Cybernetics and Computational Intelligence (CyberneticsCom)*, IEEE, Nov. 2017, pp. 158–163. doi: 10.1109/CYBERNETICSCOM.2017.8311702.
- [19] M. Indriana and M. L. Adzani, “UI/UX analysis & design for mobile e-commerce application prototype on Gramedia.com,” in *2017 4th International Conference on New Media Studies (CONMEDIA)*, IEEE, Nov. 2017, pp. 170–173. doi: 10.1109/CONMEDIA.2017.8266051.
- [20] R. Rofik, T. F. Anggraini, B. Prasetyo, and C. B. S. KA, “Application go-sport as a solution to search information on facilities, places, partners, and sports events for students,” *J. Student Res. Explor.*, vol. 1, no. 2, pp. 85–93, Jun. 2023, doi: 10.52465/josre.v1i2.164.
- [21] C. A. Prawastiyo and I. Hermawan, “Pengembangan Front-End Website Perpustakaan Politeknik Negeri Jakarta Dengan Menggunakan Metode UCD (User Centered Design),” *Inf. Sci. Libr.*, vol. 1, no. 2, pp. 1–11, 2020.
- [22] I. Izharulhaq, D. P. Lestari, and R. D. Prayogo, “Development of Audiobook Interaction Design for People with Vision Impairment Based on User-Centered Design Approach,” in *2022 International Conference on Data and Software Engineering (ICoDSE)*, IEEE, Nov. 2022, pp. 36–41. doi: 10.1109/ICoDSE56892.2022.9971922.
- [23] Y. Efindo, L. E. Nugroho, and R. Ferdiana, “The Design of Two-Way Relationship Tourism Planning System with User Centered Design (UCD),” in *2019 International Conference on Information and Communications Technology (ICOIACT)*, IEEE, Jul. 2019, pp. 38–43. doi: 10.1109/ICOIACT46704.2019.8938433.
- [24] M. R. Raihan and D. Hidayatullah, “Pengembangan Sistem Point Of Sale Berbasis User Centered Design,” *J. MEDIA Inform. BUDIDARMA*, vol. 6, no. 1, p. 74, Jan. 2022, doi: 10.30865/mib.v6i1.3412.
- [25] R. Hartono and T. I. Ramadhan, “Implementasi Metode User Centered Design (UCD) dengan Framework Kanban dalam Membangun Desain Interaksi,” *J. Algoritm.*, vol. 19, no. 2, pp. 823–831, Dec. 2022, doi: 10.33364/algoritma/v.19-2.1203.
- [26] S. Kulkarni, I. Girgaonkar, and T. Pachpol, “Text Chatting App Including Kanban Board,” in *2022 IEEE Conference on Interdisciplinary Approaches in Technology and Management for Social Innovation (IATMSI)*, 2022, pp. 1–5.
- [27] S. Jaipriya, J. Nisha, R. Pavithra, and K. Pradeepa, “Development of Smart Kanban System For Stores,” in *2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS)*, IEEE, Mar. 2021, pp. 945–948. doi: 10.1109/ICACCS51430.2021.9441780.
- [28] S. Santirojanakul, “The development of sports science knowledge management systems through CommonKADS and digital Kanban board,” in *2018 IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE)*, IEEE, Apr. 2018, pp. 119–124. doi: 10.1109/ISCAIE.2018.8405455.
- [29] S. Nakazawa and T. Tanaka, “Development and Application of Kanban Tool Visualizing the Work in Progress,” in *2016 5th IIAI International Congress on Advanced Applied Informatics (IIAI-AAI)*, IEEE, Jul. 2016, pp. 908–913. doi: 10.1109/IIAI-AAI.2016.156.
- [30] C. Kartiko, A. C. Wardhana, and D. P. Rakhmadani, “Pengembangan Mobile Learning Management System Dengan User Centered Design (UCD) Menggunakan Flutter Framework,” *J. MEDIA Inform. BUDIDARMA*, vol. 6, no. 2, p. 960, Apr. 2022, doi: 10.30865/mib.v6i2.3524.
- [31] H. Firdaus and D. Hidayatullah, “Pengembangan Sistem Informasi Pariwisata Geopark Ciletuh Menerapkan Metode User Centered Design,” *J. MEDIA Inform. BUDIDARMA*, vol. 6, no. 1, p. 81, Jan. 2022, doi: 10.30865/mib.v6i1.3413.
- [32] A. Sumarudin, Amirudin, and A. Suheryadi, “Penerapan Sistem Informasi Penelitian Internal Di Politeknik Negeri Indramayu Menggunakan Metode Kanban,” *JITS1 J. Ilm. Teknol. Sist. Inf.*, vol. 2, no. 4, pp. 103–107, Dec. 2021, doi: 10.30630/jitsi.2.4.42.
- [33] R. Cole and E. Scotcher, *Brilliant Agile Project Management: A Practical Guide to Using Agile, Scrum and Kanban*. Pearson, 2015. [Online]. Available: <https://books.google.co.id/books?id=ZxZfrgEACAAJ>