



KINA: Application of ecocentrism based learning to strengthen early forest care spirit through the tri hita karana value approach

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ABSTRACT

Background: The transition from Gen Z to Gen Alpha has led to a shift in social activities, with children facing challenges from excessive device use, resulting in potential addiction and exposure to negative content. This issue is often rooted in inaccurate parenting methods. To address this, the value of Tri Hita Karana, which promotes harmony between humans, nature, and God, offers a potential solution. The KINA game application aims to mitigate these issues by incorporating this ancestral value while fostering climate action and forest awareness. **Method:** The study adopts a performance testing method with qualitative data quantification using scoring. The KINA game application integrates Ecocentrism Based Learning (EBL) within a pedagogical curriculum and utilizes User Interface (UI) and User Experience (UX) technology tailored for Gen Alpha. The implementation approach focuses on evaluating the effectiveness of the application in promoting climate action and forest awareness. **Findings:** The KINA game application successfully integrates the principles of Tri Hita Karana and Ecocentrism Based Learning (EBL), helping children develop an early awareness of environmental sustainability. The application demonstrates the potential to reduce device addiction while fostering a positive shift in social behavior among children, aligning with SDGs goals 4 (Quality Education), 13 (Climate Action), and 15 (Life on Land). **Conclusion:** The KINA application effectively addresses issues of device addiction and negative content exposure in children by promoting climate action and forest awareness. By integrating Ecocentrism Based Learning and Tri Hita Karana values, KINA offers a sustainable and educational solution to foster environmental consciousness from an early age. **Novelty/Originality of this article:** The KINA game application uniquely combines Ecocentrism Based Learning, Tri Hita Karana, and pedagogical curriculum design to educate children on climate action and forest awareness, offering a novel approach to parenting and digital education for the Alpha Generation.

KEYWORDS: children; tri hita karana; forest.

1. Introduction

In this modern era, the development of the times has a huge, even alarming, impact on environmental sustainability, especially forest ecosystems. Forests are one of the key elements in maintaining ecological balance, as they function as carbon sinks, water cycle regulators, habitat providers for various living creatures, and overall support for human life. Although the issue of environmental conservation is often raised through campaigns and various media, unfortunately, community involvement in supporting forest conservation is

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still relatively minimal. This lack of participation can be seen from the lack of community involvement in activities such as reforestation programs, prevention of illegal logging, or educational efforts that explain the importance of forests for life. This condition is caused by low public awareness, which is basically influenced by a lack of understanding of the role of forests. In fact, forests play a vital role, such as controlling the climate, maintaining biodiversity, and ensuring the sustainability of natural resources that support human life. Research conducted by Bera et al. (2022) shows that 68.463% of forest destruction in the world is caused by human activities. These activities include burning for land clearing, illegal logging, and other irresponsible practices that have a direct impact on the destruction of forest ecosystems. Not only that, these human activities also contribute to the increase in global temperature, which is expected to reach 1.52°C by 2024. This increase accelerates the rate of climate change that brings adverse impacts, such as natural disasters, habitat destruction, and threats to the lives of all living things on earth. To face this challenge, serious efforts are needed to raise public awareness, one of which is through education oriented towards ecocentrism values. Ecocentrism is a view that places nature as the center of life and teaches humans to live in harmony with nature. By understanding the importance of protecting forests, people are expected to be more concerned and actively involved in environmental conservation efforts, so that future generations can enjoy a sustainable and balanced earth.

Forests have a very important role in maintaining the survival of humans and other living things on Earth (Niman, 2019). As the lungs of the world, forests contribute about 28% of the total oxygen available in the atmosphere. This oxygen is the main element needed by humans and animals to breathe and carry out life functions. In addition, forests also provide a variety of priceless natural resources. For example, clean water which is a basic need in daily life, wood which is used as raw material for buildings and various industries, and natural medicinal plants which are often used in traditional and modern medicine. More than that, forests also function as areas that support recreation and tourism activities. The natural beauty of forests is often an attraction for local and foreign tourists, thus providing economic benefits for the communities living around them (Anwar et al., 2020). This function makes forests not only a provider of natural resources, but also a supporter of the economic and cultural sectors of society. However, despite the great benefits provided by forests, the threat of destruction continues to increase. Activities such as deforestation, illegal logging, and land conversion for agriculture, plantations, or development, have led to significant forest destruction. This damage not only threatens the habitat of flora and fauna, but also triggers various environmental problems. One of the impacts is the disruption of microclimates that can exacerbate the risk of natural disasters such as floods and landslides. Data from the National Disaster Management Agency (BNPB) shows that throughout 2021, Indonesia experienced 2,702 cases of natural disasters. Of these, around 89.7% were directly related to environmental damage, including forest destruction. This figure is a serious reminder that preserving forests is a shared responsibility that must be realized immediately. Forest conservation efforts are not only important to protect the sustainability of human life, but also to maintain the balance of ecosystems that are the basis of life for all living things on Earth.

Generation Z, which is the age group born between 1997 and 2012, comes after the Millennial Generation and has a number of distinctive characteristics that set them apart from previous generations. One of the main distinguishing features of Generation Z is their heavy reliance on technology, particularly the internet and digital devices. The survey was conducted among 415 students at the State University of New York during the 2017-2018 academic year. The results revealed that almost all Gen Z (99%) own a smartphone, and 98% of them use it to connect to the internet. More than half of Gen Z spend 9 or more hours a day using their smartphones, and almost half spend 3-8 hours per day (Adiarsi et al., 2024). Unfortunately, most of these activities focus more on entertainment and less educative information, which may lead to a waste of time without maximum benefits. This excessive use of devices, if it continues without proper supervision, can potentially lead to various serious problems, one of which is the risk of addiction or dependence on digital devices

which can lead to mental health disorders (Setiawati & Fithriyah, 2020). This condition is certainly a big threat and requires more attention, considering the effects that not only affect the physical aspects, but also the psychological and social aspects of the individuals in that generation (Hu et al., 2025). To face this great challenge, one solution that can be considered is to study and apply Indonesia's traditional culture, which is rich in noble values, which have been tested for their efficacy in creating balance in life. One example that can be used as a reference is the philosophy of Tri Hita Karana from Bali. Tri Hita Karana, explained in depth by Syahriyah & Zahid (2022), is a teaching that emphasizes the importance of balance and harmony between three main elements in life, namely the relationship between humans and God, humans and fellow humans, and humans and the surrounding nature. If one of these relationships is disrupted, be it through unbalanced human behavior or excessive exploitation of nature, then naturally there will be adverse impacts that can befall our lives and the surrounding environment. Therefore, the application of Tri Hita Karana principles in our daily lives is essential to ensure the achievement of harmony and balance that will positively impact our quality of life, both physically and mentally.

Therefore, the author argues that one way to spread and internalize the values of Tri Hita Karana to Generation Z is through the development of an ecocentrism-based learning application. This application will integrate the philosophy of Tri Hita Karana with the aim of raising awareness about the importance of preserving nature, especially in terms of caring for forests, which are one of the important elements in maintaining the balance of our ecosystem. In addition, this application will also provide an understanding of human relationships with God and nature, as well as the importance of caring for nature for a better future. The development of such an app is expected to be an effective means of educating Generation Z on the importance of environmental education, as well as supporting the achievement of the Sustainable Development Goals (SDGs). Especially on key points, such as point 4 that focuses on quality education, point 13 that emphasizes action on climate change, and point 15 that deals with the preservation of terrestrial ecosystems. Thus, the app will not only have a positive impact on its users, but will also contribute to nature conservation efforts and an overall improved quality of life.

The increasing dependence on gadgets has become a major issue that affects not only mental and social health but also distances children from real-life experiences of understanding and loving nature. This research aims to address that gap. It raises the question: how does gadget addiction among children particularly those from Generation Z impact their awareness and concern for forest conservation? This becomes a compelling point of discussion and serves as the central theme of this study. The study seeks to bridge this gap by designing an ecocentric-based educational approach delivered through a digital application that connects Generation Z's digital lifestyle with environmental conservation values. One of the local principles serving as the foundation for this approach is Tri Hita Karana, a Balinese life philosophy that emphasizes harmony between humans, God, others, and nature. The application is designed not only as a learning tool but also as a means to rebuild children's connection with nature in a reflective and enjoyable way. By introducing ecocentric values through a digital medium that aligns with their lifestyle, it is expected that children's understanding and concern for forest conservation will significantly improve.

2. Methods

This research was conducted in Malang City, which is located in East Java Province, Indonesia. Malang City was chosen as the research location because it has two main advantages that are relevant to the objectives of this research. First, Malang City is known as one of the student cities in Indonesia, which means that the city has a supportive environment for academic activities, with the presence of various quality educational institutions (Hidayat et al., 2023). Second, Malang City is also recognized as one of the cities with a green concept, which means the city has a commitment to sustainable development, environmental sustainability, and environmentally friendly spatial management, as shown in (Fig 2.). This research took three full months, starting from August to October 2024. This

timeframe was chosen to ensure that the entire process of collecting, analyzing, and compiling data could be carried out in a systematic and structured manner without compromising the quality of the research results. In the preparation of this scientific work, the writing method used is the literature study approach. This approach involves the process of reading various relevant literature sources, analyzing the information contained therein, and linking the information to the topics raised in this research (Snyder, 2019). The literature sources used include scientific journals, academic articles, previous research reports, and other documents that are reliable and relevant to the issues discussed. The data used in this research is secondary data, which is data that has been previously available and obtained from trusted sources. In addition, to support the secondary data, this research also utilized a feedback approach from KINA application users. This approach involves collecting input, opinions, and preferences from users of the application. The feedback data obtained was then collected and analyzed using a scoring approach, which is a quantitative data processing method that aims to provide an assessment based on predetermined parameters. The scoring approach was used in this study with the aim of obtaining a clear picture of the level of success and effectiveness of the operation of the KINA application from the perspective of its users. Thus, the results of this analysis are expected to provide concrete and measurable input in the context of further development of the application.

Furthermore, the data that has been collected will be thoroughly analyzed by completing the data and information that is still lacking. After the data is complete, testing will be carried out using the performance testing method. This test aims to assess the performance of the data and ensure that the analysis results can provide a clear picture. In its implementation, performance testing will be combined with the comparative descriptive method. This comparative descriptive method is used to provide a systematic, actual, factual, and accurate description of the facts found in the field, as well as to analyze the relationship between these facts and the phenomena or gaps that occur in society (Pregoner, 2024). Thus, the results of the analysis are expected to be able to provide conclusions based on scientific truth. To ensure that the data obtained is of good quality and reliable, the analysis process is continued by conducting validity and reliability tests. The validity test aims to determine the extent to which the data obtained is really able to measure what should be measured, while the reliability test aims to ensure the consistency of the measurement results if the test is repeated. These two tests are very important, especially in the quantitative approach used for program implementation, because the results will be the basis for assessing the extent to which the KINA application has the expected effect. In addition, to strengthen the results of the analysis, a data synthesis process will be conducted. This process involves a comparison or cross-study between the collected data and other relevant theories, concepts and research results. With this step, the conclusions obtained are expected to be more focused, in-depth, and in accordance with the context of the study, so as to be able to make a significant contribution both in terms of theory and practice.



Fig. 1. Research location
(ArcGIS, 2024)

3. Results and Discussion

3.1 KINA definition

KINA is a digital application developed with an innovative and thoughtful approach to help raise children's awareness of the importance of protecting the environment, especially in terms of forest conservation, and encourage them to take concrete steps to face the increasingly urgent challenges of climate change. The app is not just another learning tool, but also a carefully designed tool that embraces the philosophy of Tri Hita Karana, a cultural concept originating from Bali. Tri Hita Karana teaches us about the importance of maintaining balance and harmony between three main elements in life: humans with God, humans with others, and humans with nature. This philosophy is not only the philosophical foundation for the development of this application, but also the basis that inspires every feature and content in it. Thus, KINA provides educational messages that are not only in the form of solid information, but also contain deep, relevant, and very important cultural values for our younger generation. The main objective of the KINA app is to build the mindset of children from an early age so that they can understand well how important it is to protect the environment, with a main focus on preserving the forest ecosystem which is one of the vital components for the balance of nature. The app promotes an ecosystem-based approach known as ecocentrism, which focuses on understanding the role of each element in the ecosystem, as well as how the preservation of each part of the ecosystem, such as forests, has a direct impact on the survival of humans and all living things on earth. In this approach, KINA not only educates children about the damage caused by neglecting nature, but also invites them to play an active role in environmental conservation efforts, especially forests which are the lungs of the world. More than just an educational tool, the KINA app is designed with a fun and interactive concept, which will make children feel interested and involved in the learning process. Through various features, children can learn about forests, biodiversity, and the challenges facing our environment in a fun way, such as educational games, quizzes, and inspirational stories that inspire them to care for nature. In this way, KINA seeks to create a learning experience that not only provides knowledge, but also awakens children's love and responsibility for the environment, especially in terms of forest conservation and efforts to fight climate change, which is now an increasingly urgent global issue.

The app utilizes digital devices in a smart way, where the content provided is specifically designed to suit the needs of today's children. All content on KINA follows the principles of pedagogy, so the learning material is not only informative but also easy to understand and relevant. With an interactive presentation style and engaging visuals, this app is suitable for generation Z and generation Alpha who grew up in the digital age. In addition, the content offered also supports the achievement of the 2030 Sustainable Development Goals (SDGs), especially those focusing on quality education, action on climate change, and preservation of the terrestrial environment. Thus, KINA not only helps educate children in terms of environmental insights, but also directly contributes to the larger global agenda. Furthermore, KINA also supports the implementation of the 2020-2024 National Medium-Term Development Plan (RPJMN) which emphasizes the importance of raising awareness of the public, including children, towards environmental sustainability. This shows that the app is not just a regular digital education tool, but also part of a strategic solution to build a future generation that cares more about the environment and has the courage to take real action in the face of climate change challenges. With all its advantages, KINA not only offers a fun learning experience for children, but also a place to instill the values of love for nature and the environment. Through this application, it is hoped that children can grow into individuals who are more responsible for the earth, as well as a generation capable of creating positive changes in the future.

Seven main features of KINA such as (1) Parent Linked, (2) Choose Your Character, (3) Forest Exploration, (4) Complete the Mission, (5) Star Achievement, (6) KINA Almanac, and (7) Achievement Report (Fig 3.). Harnessing the fact that children have an interest in digital

devices, the app seeks to help the kids develop environmental awareness and to inspire real actions. KINA intends to change children's perception of the environment, increase their sensitivity and motivate them to be concerned about conservation through an interactive and educational platform. Through highlighting games centering around forest conservation, the application is not only entertaining but also extremely informative of the ecosystems importance of forests. As asserted by the Food and Agriculture Organization of the United Nations (2020), Indonesia's tropical forest encompasses around 94 million hectares and, thus, has a vital role in the absorption of carbon dioxide and preservation of biodiversity. Through features like Forest Exploration and Complete the Mission, KINA familiarizes children with the importance of preserving our forests and communicates the need to understand and value the importance of forests in our lives from a young age.



Fig. 2. Seven main features of KINA application

In terms of its functionality, Parent Linked helps parents manage their child's device usage. For daily reports, this data is useful as it contains time spent on KINA app usage, the pattern, and actions taken, including activities completed. Through the app parents can be aware and motivate them easily by keeping track of if their children have completed the mission or not and can give feedback accordingly. Moreover, this feature also provides real-time notifications for parents. Choose Your Character is designed for children to pick their favorite character with each character excelling in 3 aspects of its character own; Knowledge, Sensitivity, Agility. The features are beyond just the aspect of visual preference but is to motivate the children to be creative and make their own decisions. Inside this feature, there are various characters and each character has its own uniqueness and capabilities, so that it will give some options to children to play in the KINA app. One of the key features in the KINA app is "Choose Your Character," which is specially designed for children to let them choose their favorite character. Each character has three different aspects of excellence, namely Knowledge, Sensitivity, and Agility. This feature is not just about giving children a choice of visually appealing characters, but also aims to motivate them to be creative and make decisions independently. It features a wide selection of characters with their own unique abilities, giving children the opportunity to choose and interact with characters they like, while learning about the different abilities of each character. In addition, the app also has a "Forest Exploration" feature that introduces children to the different types of forest ecosystems that exist around the world. Using an imaginative map as a backdrop, children can complete missions that take them to explore ecosystems such as tropical forests, tundra, or the Amazon rainforest. Each ecosystem has different challenges and missions, which not only teaches children about the diversity of nature but also instills the importance of environmental protection early on. This feature is designed to nurture a sense of caring for nature through fun learning. "Complete the Mission" is an educational task that aims to challenge children's understanding of the concept of ecocentrism, while expanding other important environmental skills. The missions are

organized in progressively difficult levels, encouraging children to keep learning and honing their skills as they achieve. In recognition of achievement, children will earn stars upon successful completion of missions. These stars are not only a symbol of success, but can also be used to unlock additional features or new content in the app, such as new characters or more difficult ecosystems. This “Star Achievement” system gives points or stars to recognize children's achievements, which will motivate them to keep striving for higher goals.

To visualize children's achievements, the app also includes “Star Count,” a visual display that lets children see how many stars they have collected. This not only enhances their sense of accomplishment, but also gives them a sense of pride in the effort they have put in. The accumulated stars give a clear picture of how they are progressing in the app. KINA Almanak is a feature that introduces Indonesian flora and fauna in a fun and interactive way. Through this feature, children can learn about various species of Indonesian plants and animals, while earning stickers that they can collect as rewards after achieving certain goals in the Star Achievement program. Each sticker comes with an easy-to-understand explanation, which can be attached to the pages of a child's digital book, making it a fun educational tool. This way, children can learn more about Indonesia's biodiversity and get to know their natural friends in a fun and educational way. Finally, the “Achievement Report” is a detailed report that provides information about the child's progress in using the app. This report includes what missions the child has completed, how long they have been using the app, as well as the various achievements that have been accomplished. This report will be received directly by parents on their mobile device, allowing parents to stay up to date with what their child has learned. With these reports, parents can better evaluate their child's progress and provide relevant and timely feedback to support their child's learning to the fullest.

3.2 User Interface (UI) and User Experience (UX) of KINA

KINA's User Interface (UI) and User Experience (UX) design is designed with a very thoughtful approach to capture children's attention through a combination of elements that are both visually appealing and functionally intuitive. The app utilizes vibrant colors inspired by natural forest ecosystems, such as foliage green, sky blue, and earth brown, creating a dynamic, fun, and immersive digital environment that sparks curiosity and ignites children's imaginations. Research shows that the use of harmonious colors can significantly increase children's engagement and comprehension levels in digital learning applications, as revealed in a study by You et al. (2024). In addition, the navigation of the KINA app is designed to be intuitive by presenting easy-to-understand buttons and menus, adapting to children's cognitive abilities, thus reducing the potential for confusion while promoting ease of use, as stated in the study by Faudzi et al. (2023). Not only that, the app also enriches the user experience through visual storytelling combined with smooth animation transitions and character-based interactive narration, which emotionally connects children with the app content and makes the learning process not only fun but also meaningful, as supported by Rahiem's (2021) findings.

KINA actively integrates cutting-edge technologies, such as Augmented Reality (AR) and Virtual Reality (VR), to create interactive and immersive learning experiences that engage children while enhancing their understanding of environmental issues. These technologies enable the seamless blending of real-world and digital elements, providing multi-sensory learning opportunities in innovative ways. For example, the AR feature allows children to scan a physical map which will then be overlaid with digital representations of flora and fauna, thus providing a more tangible visualization of the ecosystem. Meanwhile, VR technology brings children into immersive simulated environments, such as tropical rainforests, where they can experience experiential learning processes, such as understanding interactions in the food chain or the impact of deforestation. Furthermore, gamification in these technologies allows children to participate in interactive challenges designed to encourage active engagement and raise awareness of the importance of environmental conservation. Based on a recent study (Lee

& Huang, 2024), the application of AR and VR in education is proven to significantly improve knowledge retention, student engagement, and awareness of environmental issues. In addition, the use of this technology is also in line with contemporary educational methodologies that emphasize action-based learning and exploration, especially in understanding global issues such as climate change (Sakr & Abdullah, 2024). The integration of AR and VR technology is not just a technological innovation, but also a strategic step to form a generation that is more concerned and involved in efforts to preserve the earth.

In addition to the appealing visual elements and advanced technologies used, the sound design on the KINA app plays a very important role in creating an immersive and enjoyable user experience. Nature sounds, such as soothing birdsong and the gentle rustling of leaves, are harmoniously designed and combined with interactive music to create an immersive atmosphere. This combination not only enhances users' emotional experience but also supports their focus, mental well-being, and emotional health (Yuan & Tang, 2025). Moreover, KINA adopts an adaptive learning path that allows the content and difficulty level to automatically adjust based on each user's progress and unique needs. This kind of personalization approach has been proven effective in encouraging continuous user engagement, fostering a positive sense of accomplishment, and supporting the achievement of long-term learning goals (Contrino et al., 2024). By integrating innovative design principles, utilization of the latest technology, and a child-centered approach, KINA not only succeeds in providing a fun learning experience, but also promotes environmental awareness and sustainable education among its young users.

3.3 Ecocentrism-Based Learning (EBL) in KINA app

Ecocentrism-Based Learning (EBL) is a pedagogical approach that puts ecosystems at the core of the educational process, emphasizing the importance of the interdependent relationship between humans and the environment (Cho & Choi, 2025). It is distinctly different from anthropocentrism, which emphasizes human interests and needs over the sustainability of ecosystems, and ignores the long-term impacts on the balance of nature (Shah & Shah, 2025). Instead, EBL encourages a shift in perspective by recognizing the intrinsic value of all life forms and elements in natural systems, as described by Allen et al. (2019). As a form of concrete implementation, the KINA App adopts the principles of EBL to introduce children to the concept of ecological sustainability in depth, while teaching them about the importance of understanding the delicate balance of nature and their crucial role in protecting it. The method applied through this application aims to make children not only view nature as a resource to be utilized, but also as a system that must be sustained and respected. Thus, this approach aims to instill awareness and a sense of responsibility towards the environment from an early age, thus building a generation that is more concerned and committed to nature conservation.

The KINA app integrates a variety of interactive features specifically designed to provide an immersive learning experience for children, such as the Explore the Forest and Complete the Mission features. These features aim to get children actively involved in learning about the world's ecosystems and biodiversity. Through activities such as exploring tropical forests or polar ecosystems in a virtual environment, children are not only invited to have an adventure, but also to understand firsthand the various interactions that exist in the ecosystems that sustain life on Earth. By using this approach, the KINA app supports a more engaging and effective learning process, connecting knowledge with real-life experiences that can be felt virtually. It also provides opportunities for children to develop critical thinking and problem-solving skills that are critical in facing future environmental challenges. For example, as they complete missions within the app, children begin to better understand how human actions, both intentional and unintentional, can affect the balance of nature. This teaches them that every decision they make, no matter how small, has a big impact on the survival of the ecosystem, and fosters the awareness that every individual has a responsibility to protect and preserve nature. These principles are

aligned with the Essentially Free Report (EBL) concept that emphasizes the importance of understanding the relationship between human actions and environmental sustainability, which was emphasized in research by Chodkowski et al. (2022) and Yli-Panula et al. (2018). Thus, the KINA app is not only an educational tool, but also a platform that teaches the values of environmental conservation in a practical and in-depth manner.

In addition to providing interactive and engaging learning, the KINA app is also committed to promoting environmental responsibility through a reward system called Star Achievement, which aims to motivate children to put more effort into completing their educational tasks. This reward system is designed to encourage long-term engagement by recognizing children's achievements in understanding ecological concepts. In this way, children will feel more motivated to continue learning and exploring topics related to environmental sustainability (Yang et al., 2024). In addition, the KINA app also intelligently integrates knowledge about local ecology through various features, one of which is the KINA Almanac. This feature provides an in-depth insight into the flora and fauna around them, which helps children understand the relationship between global and local environments in the context of sustainability. Thus, the app not only teaches children about the importance of maintaining the balance of the global ecosystem, but also invites them to understand how they can play an active role in preserving the environment around them. The combination of these features ensures that KINA is not only an educational tool, but also empowers children to become environmentally responsible agents of change, which in turn can produce a generation that cares and is committed to conservation efforts (Aswani et al., 2018).

3.4 Pedagogical curriculum with action

Climate Action is a major challenge faced by the world today, and to deal with it, a holistic pedagogical curriculum integrated with environmental issues is needed. Climate Action is not only an issue related to the destruction of nature, but has also evolved into one of the main drivers in global education, aiming to prepare future generations for the impacts of human-induced climate change. Therefore, it is important to create curricula that not only focus on environmental awareness, but also provide ecological solutions that are naturalistic, i.e. in harmony with the principles of nature and sustainability. This educational strategy combines an environmental education approach with experiential education, which encourages students to be active agents of change in sustainability issues, both at the local and global levels. Research by Smith et al. (2022) revealed that a Climate Action-focused curriculum is able to encourage students' active engagement in the various environmental challenges they face, as well as support sustainable behaviors that are more aware of the impact of human activities on the earth. On the other hand, Johnson & Czerniak (2023) emphasized the importance of an interdisciplinary approach in developing the Climate Action curriculum, which integrates environmental concepts into various subjects, such as science, math, language and art. By doing so, students will better understand the close connection between human activities and their environmental impacts. This educational model facilitates project-based learning, where students are given the opportunity to identify and analyze problems in society, and design sustainable solutions (Schiele et al., 2025). Through this approach, the knowledge gained by students is not only theoretical, but translated into real practices that can benefit the community and the environment (Allan et al., 2025). It also helps students develop critical, creative, and collaborative skills that are needed to face the challenges of climate change. Research by Ribis (2024) corroborates that this project-based learning is effective in fostering a sense of concern for environmental and civic issues. In addition, data from Rahmayanti & Ilyasa (2022) further reinforces the importance of integrating Climate Action in education curricula, with students showing increased recognition and greater engagement with the issue of global warming after their school implemented a Climate Action-focused curriculum, making them better equipped to contribute to creating a more sustainable world.

3.5 Strategic action for implementing KINA

As a learning application designed with the aim of providing a fun, engaging, and effective learning experience, KINA applies the EBL (Experiential Based Learning) approach, a method that emphasizes learning through direct experience. To achieve optimal results, the implementation of this application requires close collaboration with various related parties. This collaboration is very important, especially in the early stages of program implementation, as this phase requires thorough coordination to ensure all parties involved understand their respective roles and responsibilities. In addition, coordination also includes the process of obtaining official permission from the university or college chosen as the initial location for program implementation. The selection of universities as pilot locations is not without reason. The college was chosen based on considerations of capacity, infrastructure readiness, and the ability of its human resources to support the implementation of the KINA program. By becoming a pilot model, this university is expected to provide a real picture of how the KINA program can be implemented in a wider educational environment in the future. In this selection process, the readiness of the academic community, especially lecturers, teaching staff, and administration, is one of the main factors evaluated. This is important to ensure that they are able to adapt to the new learning approach offered by KINA. Once the right university is determined, the next step is to obtain formal approval and permission from the university. This permission is very important to ensure that the implementation of the program can run in accordance with the internal rules and policies of the institution. With this approval, potential administrative and technical obstacles can be minimized, so that the program can be run effectively and efficiently. Through a well-coordinated implementation, it is expected that KINA will not only be able to provide innovative learning experiences to students and lecturers, but also become a benchmark for the success of experiential learning programs. In addition, this process also aims to evaluate the extent to which the KINA application can be accepted and used by parties involved in the world of education, so that it can become the basis for wider development of this program in the future.



Fig. 3. Identification of multi-stakeholder on KINA app implementation

Some of the key stakeholders that contributed to the development, implementation, and success of the KINA application include: (1) The Ministry of Forestry, which is in charge of directing strategic policies in forest management and environmental conservation; (2) The Ministry of Education, which plays an important role in incorporating environmental conservation values into the school learning curriculum; (3) Conservation Centers, as institutions that have the authority to protect conservation areas and endemic species, while providing guidance on appropriate conservation practices; (4) Educational

Institutions, which serve as facilitators in providing hands-on knowledge to students on the importance of preserving forests; (5) National Research and Innovation Agency (BRIN), which supports the program through scientific research and development of relevant technologies; and (6) Parents, who have a central role in shaping children's early awareness of environmental values through support and guidance at home. These stakeholders synergistically play a pivotal role in instilling the spirit of climate action among children, while honing their skills in forest conservation. This spirit is realized through various activities structured in the KINA app, as summarized in Table 1. In addition to promoting a digital-based approach, the KINA app also prioritizes outdoor activities to maximize children's direct interaction with nature. One example is the treasure hunt activity designed to encourage children to explore the forest by searching for various "treasures" in the form of nature-related objects, such as unique leaves, certain flowers, or types of insects that are safely supervised. This activity not only improves children's motor skills through physical movements such as walking, running or jumping, but also strengthens their emotional intelligence, including curiosity, courage and empathy towards living things, as revealed in Humaida's (2019) research. More so, the KINA app innovatively integrates aspects of online and offline learning into the menu of achievements available within its system. This approach is designed to mold children who are not only academically smart but also resilient in facing environmental challenges. This is in line with global initiatives in supporting climate resilience while strengthening Community Based Forest Management (CBFM) programs in Indonesia (Nurlia et al., 2024). As part of the Five Year Implementation Plan, KINA applications are also focused on improving the quality of human resources through the active involvement of local communities, known as Model Forest Villages (MDH). This target is specifically directed at communities living in the National Capital Region (IKN), with the hope of creating a generation that is more concerned about environmental sustainability and economically empowered through sustainable conservation activities.

Table 1. Analysis function of stakeholder in KINA

Stakeholder	Function
Ministry of Forestry	Assists in the KINA application development and execution as part of environmental protection and forest preservation programs. Gives policy and regulatory assistance for integrating this application into education and environmental programs. These will monitor and evaluate progress towards effectiveness of KINA in building environmental and forest awareness among children.
Ministry of Education	Introduces the integration of the KINA application into formal school curricula. Trains teachers to teach about forest and environmental topics via the application. Integrates promotion and socialization of KINA usage among students through environmental education programs.
Conservation Center	Data and information regarding the conservation of forest and environment as input in the KINA application content. Manage mentoring the kids in conservation areas using KINA as a learning tool Provides support for community-based educational activities, particularly targeted toward children, emphasizing encouraging attendees to participate in ongoing efforts to persuade local authorities to implement proper forest and environmental management.
Educational Institutions	Supports the aforementioned by stimulating young people to participate in various forest and environmental events that the application enables. Conducts seminars or workshops to orient students, teachers, and parents to the KINA application. As an institutions that uses KINA as a media learning to students

National Research and Innovation Agency (BRIN)	Conduct research to create and enhance the quality of KINA both technology and content. Encourages innovation in designing application features that improve environmental education for children. Assesses the effect of KINA on children's knowledge and awareness regarding preservation of the environment.
Parents	Guides and encourages kids to use the KINA app as part of their learning experiences on forests and the environment. Menggunakan aplikasi KINA sebagai alat untuk mengajarkan nilai kepedulian terhadap lingkungan dalam kehidupan sehari-hari di rumah. Use the application to actively watch how children develop and comprehend the necessity of forests and nature.

4. Conclusions

This study highlights the KINA application as an innovative ecocentrism-based learning solution designed to instill forest conservation awareness in children from an early age. By integrating the Tri Hita Karana values, KINA not only educates users about the importance of preserving forest ecosystems but also adopts User Interface (UI) and User Experience (UX) technology tailored to the characteristics of Generation Alpha. The application’s interactive and engaging design ensures that children can learn in an enjoyable way while improving their environmental awareness. Moreover, KINA is structured to redirect children’s screen time from passive entertainment toward meaningful and educational activities, reinforcing their understanding of environmental conservation in a digital-friendly manner.

The primary contribution of this research lies in the development of an ecocentric learning model integrated into a digital application, making it highly relevant in today’s digital era. This approach presents a new perspective in environmental education, leveraging technology as an effective tool to enhance children’s awareness of forests’ crucial role in maintaining global ecosystem balance. The implementation of KINA significantly supports the achievement of Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education), Goal 13 (Climate Action), and Goal 15 (Life on Land). Furthermore, the application aligns with Indonesia’s National Medium-Term Development Plan (RPJMN) 2020–2024, particularly in improving the quality of human resources and fostering greater environmental awareness among the public.

As a strategic step, collaboration between government institutions, educational organizations, and parents is essential to ensure the widespread and effective adoption of KINA. The government can play a role in establishing policies and regulatory support for integrating this application into the national education system, while schools can utilize KINA as a supplementary teaching tool that complements existing environmental curricula. Additionally, training programs for educators are necessary to maximize the effective use of KINA in classrooms, along with outreach programs for parents to help them guide and support their children's learning experience. By fostering a multi-stakeholder approach, KINA can serve not only as an innovative digital education platform but also as a catalyst for behavioral change in younger generations, empowering them to take active roles in forest and environmental conservation.

Moving forward, further research is needed to assess the long-term effectiveness of KINA in enhancing children's environmental awareness. Additionally, expanding the application’s interactive features and adapting it to broader cultural contexts would help extend its impact across different societal groups. Future studies could also focus on evaluating the behavioral changes influenced by the application to ensure that KINA continues to evolve as an effective and sustainable learning tool, fostering a generation that is more conscious and proactive in protecting forest ecosystems and the environment as a whole.

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Author Contribution

Conceptualization, M.K.H.; Methodology, E.B.S. and M.H.R.A.; Software, M.K.H.; Validation, M.K.H., E.B.S., and M.H.R.A.; Formal Analysis, E.B.S.; Investigation, M.H.R.A.; Resources, M.K.H.; Data Curation, E.B.S.; Writing – Original Draft Preparation, M.K.H.; Writing – Review & Editing, E.B.S.; Visualization, M.H.R.A.; Supervision, M.K.H.; Project Administration, M.K.H.; and Funding Acquisition, M.H.R.A.

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