Enhancing Ecopreneurship Competency Through Bidan Elok E-Learning Based on Local Wisdom

Risma Haris[1*] (iD), Sergul Duygulu[2] (iD), Andi Hafidah[3] (iD), Rosdiana Syakur[4] (iD), Budi Djatmiko[5] (iD), Andi Maryam[6], Andi Indrawati[7]

[1,6,7]Department of Midwifery, University Kurnia Jaya Persada, Indonesia
[2]Department of Nursing, Hacettepe University, Turkey
[3]Department of Management, University Kurnia Jaya Persada, Indonesia
[4]Department of Nutrition, Indonesia Timur University, Indonesia
[5]Master of Innovation Management, University of Digital Technology, Indonesia
[1]arismarifin@gmail.com, [2]sduygulu@hacettepe.edu.tr, [3]andihafidah16@gmail.com, [4]rosdianaary@gmail.com,
[5]budidjatmiko@digitechuniversity.ac.id, [6]andimaryam778@gmail.com, [7]andindrawaty2303@gmail.com
*Corresponding Author

Article Info

ABSTRACT

Local wisdom-based ecopreneurship focuses on sustainability and environmental preservation, offering midwives the opportunity to utilize local natural resources efficiently while preserving social and cultural values. In South Sulawesi, integrating ecopreneurship into midwifery education remains underexplored. This study evaluates the effectiveness of the "Bidan Elok" E-Learning platform in enhancing midwifery students ecopreneurship competency, aligning with Sustainable Development Goals (SDGs) 4 (Quality Education) and 8 (Decent Work and Economic Growth). A One Group Pre-Test and Post-Test design was conducted with 150 midwifery students from Gowa, Makassar, Parepare, and Palopo. **The study measured** competency changes before and after using local wisdom-based learning media. **Results indicated a significant** improvement, with average scores increasing from 58.4 (pre-test) to 82.6 (post-test). Effectiveness varied by work experience, with the highest N-Gain score (0.72) in the 0-5 years experience group and the lowest (0.60) in the 15-20 years group. E-Learning media integrated with local wisdom values effectively enhanced students ecopreneurship competency. However, more adaptive approaches are needed for students with longer work experience. **This study recommends further** development of technology and culture-based learning methods to strengthen ecopreneurship competency in midwifery education and support SDG achievement.

1. INTRODUCTION

The enhancement of competencies in the healthcare field, particularly for midwifery students, is a strategic step toward improving service quality and advancing their professional development. Local wisdom-based ecopreneurship skills have become one of the essential competencies, especially in addressing the challenges of sustainable development [1–3]. Ecopreneurship, as an entrepreneurial concept focused on sustainability and environmental preservation, provides healthcare professionals with the opportunity to utilize local

natural resources efficiently and in an environmentally friendly manner while preserving local social and cultural values, supporting SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) [4]. The people of South Sulawesi are known for their diversity, ethnologically divided into four main ethnic groups: Bugis, Makassar, Mandar, and Toraja. Each group has unique natural resources and socio-cultural identities, with their communities scattered across various settlements that can be developed as resources for ecopreneurship [5, 6]. The socio-cultural aspects of these ethnic groups are reflected in the social norms that influence community behavior, including maternal healthcare practices. For example, in South Sulawesi, local wisdom includes practices such as Appasili (a seven-month pregnancy tradition), which aims to maintain cleanliness and enhance the well-being of pregnant women to avoid negative outcomes [7]. Traditional physical activities like morning walks around the village are also believed to help prepare the body for smooth childbirth [8–10]. Additionally, Mappanre to Mangideng (feeding the pregnant woman) is a Bugis ritual where family members feed the mother with healthy foods [11, 12]. A healthy diet using local foods, such as seafood and green vegetables, has been passed down as wisdom to maintain the health of pregnant women. The unique traditions relevant to the context of midwifery and ecopreneurship serve as the foundation for developing the learning content on the Web Bidan Elok platform.

However, the main challenge faced by midwifery students is the limited access and time to receive training outside of the formal curriculum [13–16]. Therefore, educational technology, such as E-Learning, presents a potential solution, contributing to SDG 4 (Quality Education). E-Learning not only offers flexibility in the learning process but also enables access to materials relevant to local needs without relying on physical locations or strict schedules. The Bidan Elok platform, an E-Learning tool, is designed to facilitate midwifery students learning of ecopreneurship based on local wisdom [17, 18]. This platform offers interactive modules that provide insights into how to efficiently and sustainably utilize local resources in a healthcare context..

While numerous studies have examined the effectiveness of E-Learning in healthcare education, the integration of local wisdom into ecopreneurship education remains limited [19, 20]. Therefore, this study was conducted to enhance E-Learning methods by integrating the spirit of ecopreneurship and the values of South Sulawesi local wisdom into the education of midwifery students [21–24]. This approach offers a significant contribution with several advantages compared to existing methods, namely:

- Cultural and Contextual Relevance: The integration of South Sulawesi local wisdom values, such as the principles of environmental sustainability and communal cooperation, complements generic E-Learning models that often overlook cultural contexts. As highlighted by [25], culturally relevant approaches have greater potential to enhance learners understanding and engagement.

- Strengthening Ecopreneurship Competence: Ecopreneurship-based learning supports the development of environmentally friendly entrepreneurial skills, which, according to [26], represent a competitive advantage in the modern healthcare industry.

- Enhancing Adaptability Through Work Experience Evaluation: This approach also surpasses traditional models by tailoring materials based on students work duration and workplace settings. As emphasized by [27], personalization is crucial in improving the effectiveness of technology-based learning.

- Innovation in Multidimensional Integration: This study combines elements rarely applied simultaneously: E-Learning, local cultural values, and ecopreneurship [28]. This integration provides a learning model that is not only innovative but also offers concrete solutions to the limitations of conventional E-Learning methods.

Thus, this approach complements and surpasses previous learning methods by creating synergy between technology, culture, and professional competency development. This contribution is not only locally relevant but also has the potential to become a culturally-based learning model that can be replicated in various global contexts.

2.   MATERIALS AND METHOD
This study employed an experimental One Group Pre-Test and Post-Test design [23, 24, 29] focusing on the effectiveness of the E-Learning method in enhancing Ecopreneurship competencies based on the local wisdom of South Sulawesi among midwifery students.

2.1. Area Location

The research was conducted in four regions of South Sulawesi: Gowa Regency, Makassar City, Parepare City, and Palopo City, with a total of 150 midwifery students as respondents. Figure 1 shows a map of South Sulawesi, located on the island of Sulawesi, one of the largest islands in Indonesia. Transformation into Graph Data Format
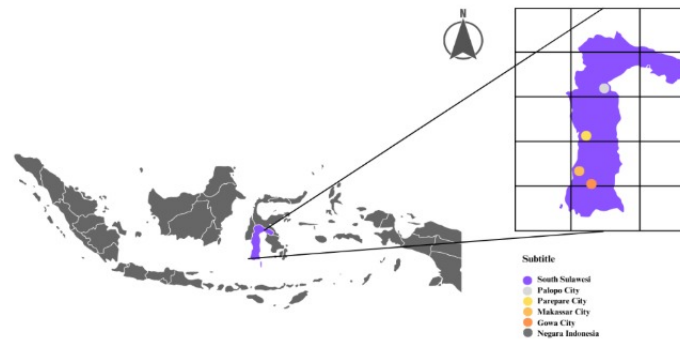

Figure 1. Research Area in South Sulawesi

The four regions selected for this study Gowa Regency, Makassar City, Parepare City, and Palopo City were chosen based on strategic and representative considerations. Makassar City, as the capital of South Sulawesi, serves as a modern center for education and healthcare, equipped with various supporting facilities [30]. Gowa Regency, as a surrounding area, maintains close ties with Makassar and reflects rural characteristics with strong local values [31]. Parepare City and Palopo City were selected because they are municipalities located in the northern and central parts of South Sulawesi, with growing access to education and healthcare services. By selecting these regions, the study encompasses relevant geographical and socio-economic variations to evaluate the effectiveness of the E-Learning method based on local wisdom across diverse cultural and environmental contexts [32].

2.2. Materials

The Bidan Elok web platform, which integrates ecopreneurship competencies and the local wisdom values of South Sulawesi, was developed based on the following components:

2.2.1. Infrastructure

A server connected to the internet and a smartphone/laptop from Figure 2. The server plays a crucial role in ensuring that the website operates smoothly and is accessible to users at any time [33–35].
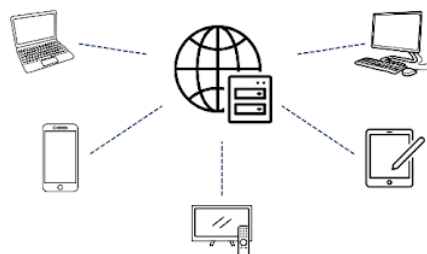

Figure 2. Server Access

In this study, the type of server used includes:

- Web Server: which stores and delivers web pages to users.

- Database Server: which stores data and provides access to users or applications servers typically have much greater storage capacity, processing power, and internet connectivity compared to consumer devices like laptops or smartphones [36–38]. Servers function to handle user requests, allowing individuals to access information or services at any time.

2.2.2. Learning Materials

The Bidan Elok platform is designed with tailored learning materials for midwifery students, specifically to support the development of ecopreneurship competencies based on local wisdom that reflects the traditions and cultural practices of various ethnic groups in South Sulawesi. The materials include:

- Maternal Personal Hygiene: The application of ecopreneurship principles in maternal personal hygiene based on local wisdom not only benefits the health of mothers and their babies but also supports environmental sustainability and the local economy. The integration of culture, health, and ecology is a crucial step toward improving the well-being of communities in South Sulawesi [39].

- Healthy Diet for Pregnant Mothers: Integrating ecopreneurship principles into a healthy diet for pregnant mothers based on South Sulawesi local wisdom not only benefits maternal and fetal health but also supports environmental conservation and the local economy. By utilizing local food resources and minimizing environmental impacts, pregnant mothers can enjoy meals that are healthy, nutritious, and sustainable [40].

- Physical Activities for Pregnant Mothers: Incorporating ecopreneurship principles and local wisdom into physical activities for pregnant mothers in South Sulawesi benefits both maternal and fetal health while supporting cultural preservation and environmental sustainability. Physical activities based on local wisdom can provide environmentally friendly solutions while adding value to the local community [41].

2.2.3. Bidan Elok Media Application

This platform encompasses all the technical features of "Bidan Elok", including learning materials specifically tailored to the needs of midwifery students and pregnant mothers. The platform is also equipped with technology-based integrative tools such as testimonials from pregnant mothers, a Q&A feature, and "Halo Bidan" (contacting experts):

- Website

Figure 3. Website Apperance

As shown in Figure 3, the Bidan Elok website consists of various sections like a Home, Profile, Learning Materials, Articles, Gallery, Testimonials, Q&A, Contact, and Admin Login, all designed to provide structured and easily accessible information for users. Each page serves a specific function, such as introducing the website, providing educational materials, displaying the latest articles, documenting activities, offering testimonials, answering frequently asked questions, providing contact information, and granting special access for admins. This design aims to deliver an informative, interactive, and easily manageable experience for all visitors [42].
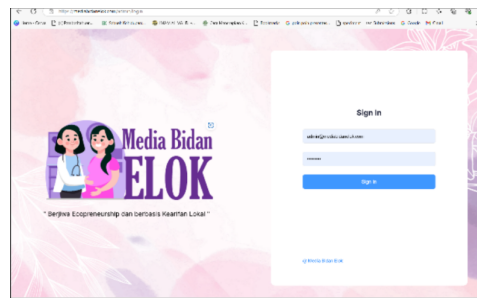
Figure 4. Admin Login

- Admin

  This Figure 4 shows the admin login page for the "Media Bidan Elok" platform. On the left side, there is the "Media Bidan Elok" logo featuring two female midwives with an attractive background, accompanied by the tagline "Succeeding in Ecopreneurship and Based on Local Wisdom." On the right side, there is a login form with fields to enter the email and password, as well as a button to sign in. The design uses a soft and elegant color combination, creating a professional and user-friendly appearance.
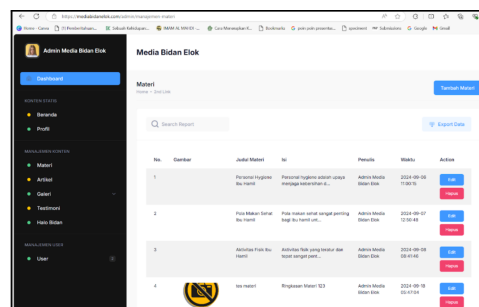

Figure 5. Admin dashboard

For the Bidan Elok admin, as shown in Figures 4 and 5, there are various features to manage content, including:

- Add Profile Content: Manage the website profile information, such as description, vision, mission, and contact details.
- Add Learning Materials: Include and systematically arrange educational resources that cover essential topics such as personal hygiene practices, recommended physical activities, and the importance of maintaining healthy eating habits specifically tailored for pregnant women, ensuring that the content is comprehensive, easy to understand, and relevant to their unique health needs during pregnancy.
- Add Articles: Manage articles by setting the title, content, category, and publication date.
- Add Gallery: Upload and manage photos and videos from events and activities in the gallery.
- Add Testimonials: Add and edit testimonials from users to showcase feedback and experiences.
- Add Halo Bidan: Manage the Q&A or consultation forum between visitors and midwives.
- User Management:Organize user accounts, roles, and access permissions for different website features.

These features help administrators effectively manage content and interactions within the website, ensuring smooth operation and user engagement.

2.2.4. Accessibility and Technological Flexibility
The platform is accessible via both computers and mobile devices, ensuring learning flexibility anytime and anywhere. It also facilitates students in areas with limited internet access by allowing them to download materials for offline study, thus expanding access without technological barriers. The combination of

local cultural values and modern technology makes Bidan Elok an inclusive, sustainable, and culturally relevant learning solution. With its scalability and flexibility, the platform can be adopted by other educational institutions or even developed into a national model for health education based on local wisdom.

2.3. Methods

This study used a pre-experimental One Group Pre-Test and Post-Test Design [43]. It involved 150 fifth-semester midwifery students from four universities, categorized by work experience (0–5 years, 5–10 years, 10–15 years, and 15–20 years) and workplace (hospital, clinic, private practice, and fresh graduates). Ethical approval was obtained from the Kurnia Jaya Persada Institute of Health and Business under approval number 235/IKB-KJPLPPM/P/VI/2024. Participants signed a consent form before the pre-test and post-test, ensuring voluntary participation and data confidentiality.

Each student took a pre-test based on ecopreneurship principles and local wisdom values, such as sustainable entrepreneurship and natural resource management. An example of a test question was: *"How can a midwife sustainably utilize local resources in midwifery practices?"*

After the pre-test, the Web Bidan Elok platform, integrating maternal health with ecopreneurship principles and local wisdom from South Sulawesi, was used for several weeks. Surveys and focus group discussions were conducted to gather feedback on the platform usability, which was then used to improve the platform. After the treatment, students completed a post-test to evaluate competency improvements.

The data were analyzed using:

- Descriptive Statistics (mean, minimum, maximum)
  To describe the overall results using SPSS software.

- N-Gain Score Test
  To measure the improvement in competency. According to [44], it is calculated using the formula.
  The N-Gain Score test, according to [44] is calculated using the following formula:

$$\text{N-Gain Score} = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}}$$

Explanation:
N Gain : Stating the Normality Test Value of the Gain

$$S_{\text{post}} : \text{refers to the pre-test score}$$
$$S_{\text{pre}} : \text{refers to the post-test score}$$
$$S_{\text{maks}} : \text{refers to the maximum score}$$

Table 1 illustrates the N-Gain value categories based on the score thresholds used to assess the effectiveness of the intervention in the learning process:

Table 1. N-Gain Score Criteria

Threshold	Category
N-Gain < 0,3	Low
0,7.N-Gain > 0,3	Medium
N-Gain > 0,7	High
Source: [29]	

N-Gain scores are used to compare pre-test and post-test results relative to the maximum possible score. A score less than 0.3 (Low) indicates minimal improvement in skills or understanding. A score between 0.3 and 0.7 (Medium) reflects moderate effectiveness, with reasonable improvement. A score greater than 0.7 (High) shows significant improvement in understanding.

Table 2. N-Gain Effectiveness Categories

Presentase (%)	Interpretation
< 40	Ineffective
40 − 55	Less Effective
55 − 75	Quite Effective
> 76	Effective

Source: [29]

Table 2 provides an interpretation of the percentage of N-Gain values to assess the effectiveness of the intervention in improving participants skills or understanding:

- < 40 % (Ineffective): If the N-Gain percentage is below 40%, the intervention is considered ineffective, with very little or no significant improvement.

- 40–55% (Less Effective): Within this range, the intervention is deemed less effective, showing only slight improvement in post-test results compared to the pre-test.

- 55–75% (Moderately Effective): This range indicates that the intervention is moderately effective. There is a significant improvement in participants understanding, but the results are not yet optimal.

- > 76% (Effective): This percentage indicates high effectiveness. The intervention successfully provides a substantial improvement in understanding or skills.

This table is crucial for providing a quantitative interpretation of N-Gain analysis results, making it easier for researchers to conclude the success level of the intervention.

3.   RESULT AND DISCUSSION
3.1.   Descriptive Statistics

The distribution of respondents based on region and workplace is a crucial element in this study to understand the diversity of experiences and professional backgrounds of midwifery students. This data provides an overview of the number of respondents working in various workplace categories, such as hospitals, clinics, private practices, as well as fresh graduates, across the four research areas: Gowa, Makassar, Parepare, and Palopo.
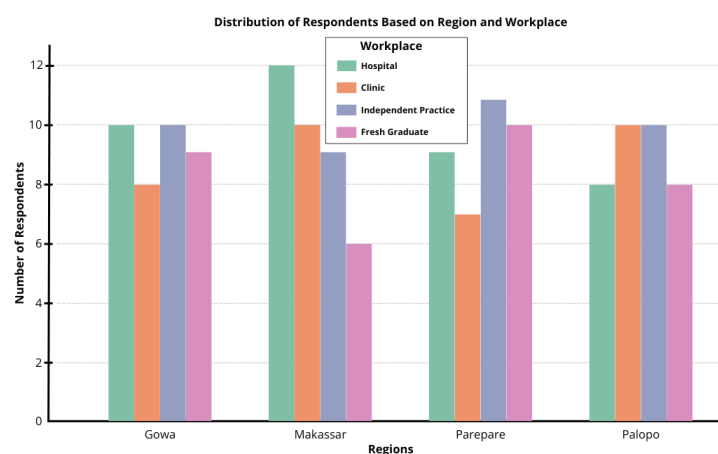

Figure 6. Diagram of Respondent Distribution by Region and Workplace

This diagram on figure 6 presents the number of respondents distributed across the four research areas (Gowa, Makassar, Parepare, and Palopo) based on workplace categories: Hospitals, Clinics, Private Practices, and Fresh Graduates.

- Gowa Region: The majority of respondents are from the Private Practice category (10 individuals). The number of respondents in other categories is relatively balanced, ranging between 8–10 individuals.

- Makassar Region: Hospitals are the primary workplace, with the highest number of respondents (12 individuals). Fresh graduate respondents have the lowest number in this region (6 individuals).

- Parepare Region: This region shows an almost even distribution across all workplace categories. Private Practice (11 individuals) slightly dominates compared to other categories.

- Palopo Region: Clinics and Private Practices each have the highest number of respondents (10 individuals). Fresh graduates are slightly fewer, with 8 respondents.

The Gowa and Makassar regions show a balanced distribution of respondents across all workplace categories, with Makassar having more respondents in hospitals and clinics, indicating a preference for formal healthcare facilities. In contrast, Parepare and Palopo have a higher proportion in private practice and fresh graduates, suggesting a preference for independent work or recent graduation.

The Web Bidan Elok materials incorporate South Sulawesi local wisdom, such as Appasili, morning walks, and Mappanre To Mangideng, which are key elements in the learning content. Focus group discussions with midwifery lecturers from each region were held to assess the platform effectiveness in enhancing competencies and integrating local wisdom, as summarized in Table 3.

Table 3. Results Of The Lecturers

Lecturers Work Area	Statement	Focus of Needs	Common Challenges
Lecturer A Makassar City	E-Learning can be an effective tool in supporting the mastery of midwifery competencies, particularly regarding the role of physical activity in maintaining the health of pregnant women, which remains low due to the lack of specific materials addressing this issue [45].	Highlighting the lack of specific E-Learning materials addressing physical activities to maintain the health of pregnant women.	There is still a lack of material in the E-Learning for students that discusses physical activities to maintain the health of pregnant women.
Lecturer B Gowa Regency	It is hoped that the E-Learning platform will provide flexibility in learning about the local wisdom of South Sulawesi by integrating local food that is rich in nutrients. Currently, many students are more interested in modern foods. The main challenge is the lack of learning supplements for students about the benefits of local food available in the region [46].	Emphasizing the importance of integrating locally sourced, nutrient-rich foods into the learning process.	Students are more interested in modern foods and there is a lack of supplementary learning materials related to the benefits of local foods.

Dosen C Maros Regency	The implementation of E-Learning allows midwifery students to study the concept of ecopreneurship independently and collaboratively, particularly in the context of local wisdom related to maternal and child health[41].	Focusing on independent and collaborative learning of ecopreneurship concepts.	There is still a lack of E-Learning materials that study local wisdom related to maternal and child health [47].
Dosen D Palopo City	Students have a limited understanding of personal hygiene integrated with local wisdom. Therefore, it is hoped that the E-Learning platform can effectively enhance competencies, especially in utilizing local natural resources through an ecopreneurship approach [48].	Identifying the lack of students understanding of personal hygiene based on local wisdom.	Many students still neglect their personal hygiene.

This Table 3 presents the results of the Focus Group Discussion (FGD) conducted with lecturers from various regions. The discussion aimed to identify the needs and challenges faced in the education of midwifery professional students, particularly concerning the implementation of E-Learning based on local wisdom and the concept of ecopreneurship. The statements from each lecturer highlight the differing learning needs across regions. For instance, Makassar requires specific materials related to physical activities, while Gowa focuses more on local food. These insights provide valuable guidance on how E-Learning platforms, such as Web Bidan Elok, can be tailored to address the unique needs of each region, making them more effective and contextually relevant. Based on the discussions with lecturers from various regions in South Sulawesi, all regions emphasized the importance of integrating local wisdom into the learning process, ranging from local food to personal hygiene, which aligns with the concept of ecopreneurship. As a result, three integrated materials incorporating economic, environmental, and local wisdom values of South Sulawesi were developed for the Web Bidan Elok platform:

- Local Food and Nutrition for Pregnant Women: Emphasizing sustainable use of local resources to support maternal health.

- Personal Hygiene Practices: Culturally grounded hygiene practices that align with local traditions and environmental sustainability.

- Traditional Physical Activities for Pregnant Women: Activities rooted in local culture that promote health while preserving traditional practices.

Figure 7. Materials of the Bidan Elok Web Platform

As shown in Figure 7, the learning materials on the Bidan Elok platform cover three main topics Personal Hygiene, Physical Activity, and Healthy Diet for Pregnant Women which integrate midwifery competencies, ecopreneurship, and the local wisdom of South Sulawesi.

- Personal Hygiene: Teaches personal cleanliness to prevent infections using eco-friendly products, while promoting self-reliance through the creation of care products based on local natural ingredients [49–52].

- Physical Activity: Provides safe exercise guidelines for pregnant women, incorporating traditional movements and local rituals, and develops community-based pregnancy exercise programs [53–56].

- Healthy Diet: Creates meal plans using local ingredients, supports healthy food businesses for pregnant women, and integrates traditional foods such as kapurung and pallu mara with modern medical recommendations.

These materials aim to enhance midwives competencies in providing sustainable and culturally appropriate maternal healthcare.

3.2. Pre-Test and Post-Test Results

Based on the analysis of the pre-test and post-test, there was a significant increase in ecopreneurship competence based on local wisdom after the students participated in the learning through the Media Bidan Elok.
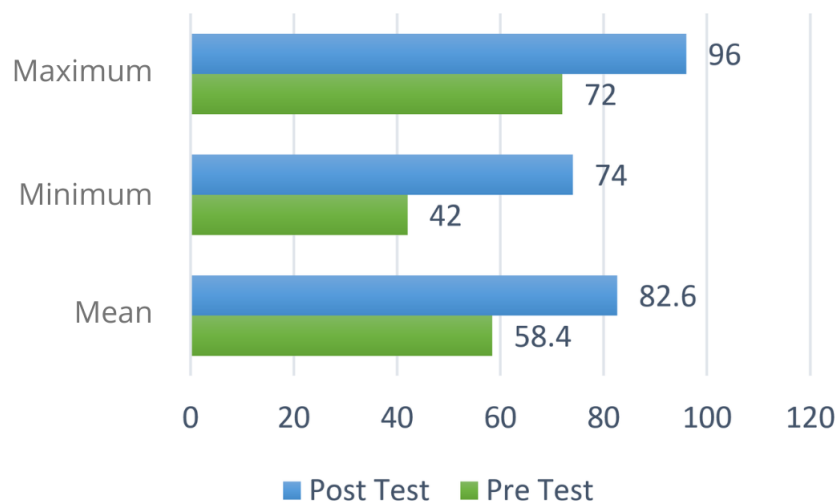

Figure 8. Result Pre Test - Post Test

Figure 8 illustrates the improvement in students competencies after receiving treatment through learning using the Web Bidan Elok platform, which is integrated with the principles of ecopreneurship and local wisdom values. Based on the measurements, there is a significant increase from pre-test to post-test results, which can be interpreted as follows:

- Mean (Average): The average pre-test score was 58.4, indicating the students initial abilities were still quite low. However, after the post-test, the average score significantly increased to 82.6, showing the effectiveness of the learning method. This indicates a significant improvement in understanding or skills after participating in the local wisdom-based learning [57].

- Minimum (Lowest score): The lowest pre-test score was 42, indicating that some participants had limited understanding of the initial material. After the post-test, this score increased to 74, showing a significant improvement, even though participants with the lowest scores were still present. The improvement in the minimum score indicates that all participants experienced improvement in their test results [58].

- Maximum (Highest score): The highest pre-test score was 72, reflecting the upper limit of students abilities before the learning session. Meanwhile, the post-test score increased to 96, reflecting the success of some students in mastering the material optimally. This indicates that participants with the best results also experienced significant improvement [59].

The difference in the average score between the pre-test (58.4) and post-test (82.6) shows a competency increase of 24.2 points, indicating that the Web Bidan Elok platform is effective in improving students understanding and skills. Meanwhile, the improvement in the minimum score from 42 to 74 indicates that all students experienced a competency improvement, although with varying success rates. Similarly, the increase in the maximum score from 72 to 96 reflects that some students were able to achieve optimal understanding and mastery of the material after the treatment [60–62].

3.3. Based on Work Experience

Table 4. Descriptive Statistics Of Pre Test And Post Test

Length of Experience (Years)	N-Gain Score (Average)
0-5 Years	0.72
5-10 Years	0.68
10-15 Years	0.65
15-20 Years	0.60
Average	**0.66**

This Table 4 presents the average N-Gain scores based on work experience groups (in years) of midwifery students who participated in learning through the Web Bidan Elok platform. N-Gain is used to measure the effectiveness of learning by comparing the differences between pre-test and post-test results. Higher N-Gain scores indicate a more significant improvement in students competencies. The following is an explanation of the effectiveness of the learning material for subjects with various work experience:

- 0-5 Years: The group with relatively new work experience has an average N-Gain of 0.72, indicating a substantial improvement in competence after the learning intervention.

- 5-10 Years: This group has an average N-Gain of 0.68, slightly lower than the 0-5 years group, but still showing significant improvement.

- 10-15 Years: Midwifery students with 10-15 years of work experience have an average N-Gain of 0.65, which is slightly lower than the previous two groups but still reflects a positive competence improvement.

- 15-20 Years: The group with 15-20 years of work experience has an average N-Gain of 0.60, which is slightly lower than the other groups, but still shows competence improvement.

- Overall Average: The overall average N-Gain for all groups is 0.66, indicating that, in general, E-Learning is effective in improving the competence of midwifery students, although there is some variation depending on work experience.

From this data, it can be concluded that the group with 0-5 years of experience showed the greatest improvement, likely due to their openness to new learning and fresher knowledge. Groups with more years of experience (15-20 years) experienced a slightly lower increase, possibly because they already have more field experience and a deeper understanding of practical work, making learning based on new theories or concepts somewhat less relevant to themOverall, all groups showed a positive N-Gain, indicating that the E-Learning platform has a significant impact on improving midwifery students competence, regardless of their work experience.

3.4. Discussion

3.4.1. Improvement of Ecopreneurship Competence Based on Local Wisdom

The analysis of pre-test and post-test results indicates a significant increase in ecopreneurship competencies based on local wisdom among students after engaging with the Bidan Elok learning media. This is evidenced by improvements across all statistical indicators, namely mean (average), minimum, and maximum scores.

- Mean: The average score increased significantly from 58.4 in the pre-test to 82.6 in the post-test, a 24.2-point improvement. This demonstrates the effectiveness of integrating local wisdom with ecopreneurship concepts, including practices like Appasili, traditional morning walks, and the mappanre to-mangideng ritual, which all contributed to students enhanced understanding.

- Minimum Score: The minimum score improved from 42 in the pre-test to 74 in the post-test, showing significant progress in students understanding, even for those with initially low competence.

- Maximum Score: The maximum score increased from 72 in the pre-test to 96 in the post-test, indicating that even students with high initial competence saw improvement, highlighting the effectiveness of the learning modules.

Overall, these results demonstrate that the development of learning materials integrated with local wisdom and ecopreneurship contributed positively to enhancing the competence of midwifery students in the topic of maternal health. The use of learning media like Bidan Elok, which combines theory with culture-based practices, has proven successful in improving students understanding and skills.

3.4.2. The Influence of Work Experience on Learning Effectiveness

The analysis results indicate that the effectiveness of the learning process, measured by N-Gain Scores, varies based on participants work experience:

- 0-5 Years: Participants with 0-5 years of experience showed the highest N-Gain Score of 0.72, indicating greater responsiveness to technology-based learning and local wisdom.

- 5-10 Years: With an N-Gain Score of 0.68, this group still showed good competency improvement, remaining open to new learning methods despite more experience.

- 10-15 Years: This group had a lower N-Gain Score of 0.65, suggesting slower adoption of new methods due to comfort with previous teaching practices.

- 15-20 Years: The lowest N-Gain Score of 0.60 was observed in this group, indicating challenges in adopting new learning approaches, likely due to resistance to change.

- Overall Average: The overall N-Gain Score of 0.66 shows that learning based on local wisdom is generally effective, especially for those with less work experience.

3.4.3. Challenges in the Implementation of E-Learning Platform

Although the Bidan Elok platform has proven effective in enhancing students competencies, several challenges remain:

- Limited Technology Proficiency: Not all students possess adequate skills to access the E-Learning platform. Training is essential to optimize platform utilization.

- Understanding Gaps Based on Work Experience: Students with more work experience adopt technology-based learning methods slower. Adapting the learning approach to their backgrounds is crucial for effective learning.

- Limited Internet Connectivity and Device Compatibility: In South Sulawesi, limited internet connectivity and device compatibility pose challenges. The Web Bidan Elok platform is optimized for low-spec devices and supports offline modes. Collaboration with universities and clinics ensures stable internet access.

The study supports previous research on the importance of technology in health education and highlights how integrating local wisdom enhances ecopreneurship competencies. [29] found that E-Learning in midwifery education improves collaboration and best practice sharing, which aligns with this study results. Students using Media Bidan Elok showed significant increases in ecopreneurship competencies, particularly in sustainably utilizing local resources.

This study also emphasizes the value of integrating technology into health education, especially in teaching environmental sustainability, aligned with local conditions. Local wisdom in ecopreneurship, like the sustainable use of natural resources, is key in training healthcare professionals committed to environmental sustainability.

Moreover, [43] highlights the importance of responsibly using natural resources in public health practices, which aligns with the study findings on local wisdom-based learning impact on students awareness of ecopreneurship. This research reinforces the value of integrating local values into education to enhance the competencies of midwifery students.

4. MANAGERIAL IMPLICATIONS

The study results show that combining local wisdom and ecopreneurship effectively enhances midwifery students competencies, with significant post-test improvements indicating successful application of the concepts. However, students with more work experience faced challenges in adopting technology-based learning, suggesting the need for a more adaptive approach, such as blended learning or specialized technology training. The Bidan Elok platform should continue to be developed, with adjustments based on work experience and individual needs, and can be expanded for students with more experience. Challenges in implementing the E-Learning platform include limited technology proficiency, gaps in understanding based on work experience, and accessibility issues due to poor internet connectivity and device compatibility in rural areas. To address these, the platform has been optimized for low-spec devices and offline modes, and efforts are underway to ensure stable internet access for students.

The findings align with previous studies emphasizing the importance of technology in health education and the role of local wisdom in enhancing ecopreneurship competencies. Midwifery students using Media Bidan Elok showed significant improvement in utilizing local resources sustainably. Integrating technology and local wisdom into health education fosters environmental sustainability and helps create more environmentally conscious healthcare professionals. The study reinforces the value of incorporating local values into education to improve midwifery students competencies.

5. CONCLUSION

This study concludes that ecopreneurship learning based on local wisdom, implemented through the Bidan Elok E-Learning platform, significantly enhances midwifery students competencies related to maternal health. The integration of traditional practices such as mappakasiri, mappalili, and locally based dietary habits proved effective in deepening students understanding of sustainable healthcare practices rooted in community values. The substantial improvement in pre-test and post-test scores across all participant groups demonstrates the efficacy of combining cultural knowledge with digital education platforms, supporting the achievement of SDG 4 (Quality Education), SDG 3 (Good Health and Well-being), and SDG 12 (Responsible Consumption and Production).

Future research should consider expanding the scope of the platform to other healthcare education disciplines such as nursing or community health, and incorporating adaptive features like artificial intelligence to personalize learning experiences. Longitudinal studies are also recommended to evaluate the long-term impact of such platforms on students clinical practice and community engagement. Furthermore, comparative studies across different regions in Indonesia can provide broader insights into the effectiveness of local wisdom integration within digital learning environments.

The implications of this study suggest a strong potential for the Bidan Elok model to be adopted nationally or even globally, especially in multicultural contexts. The approach offers a replicable model that aligns technology with cultural relevance and sustainability. Institutions should consider investing in culturally adaptive E-Learning content and infrastructure, while also providing additional support for learners with extensive work experience to bridge adaptation gaps. This model not only enhances educational outcomes but also supports the development of environmentally conscious healthcare professionals committed to sustainable development goals.

6. DECLARATIONS

6.1. About Authors

Risma Haris (RH) iD https://orcid.org/0000-0001-7860-2624

Sergul Duygulu (SD) iD https://orcid.org/0000-0002-6878-7116

Andi Hafidah (AH) iD https://orcid.org/0000-0002-1112-6480

Rosdiana Syakur (RS) iD https://orcid.org/0000-0001-8610-0042

Budi Djatmiko (BD) iD https://orcid.org/0009-0005-0298-7560

Andi Maryam (AM) iD -

Andi Indrawati (AI) iD -

6.2. Author Contributions

Conceptualization: RH; Methodology: RS; Software: BD; Validation: SD, AH and AM; Formal Analysis: AI and RH; Investigation: RH; Resources: AH; Data Curation: RS; Writing Original Draft Preparation: BD and RS; Writing Review and Editing: AH and AM; Visualization: AI; All authors, RH, SD, AH, RS, BD, AM, and AI, have read and agreed to the published version of the manuscript.

6.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.4. Funding

6.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

REFERENCES

[1] M. I. Buzohera and A. Mwakipesile, "Assessing ecopreneurship impact on composite sustainability in the food and beverage industry: A holistic ahp approach integrating economic and environmental dimensions." *Environmental and Sustainability Indicators*, vol. 22, p. 100408, 2024.

[2] A. A. Gunawan, A. A. van Riel, and C. Essers, "What drives ecopreneurship in women and men?-a structured literature review," *Journal of Cleaner Production*, vol. 280, p. 124336, 2021.

[3] T. Ljungkvist and J. Andersén, "A taxonomy of ecopreneurship in small manufacturing firms: A multidimensional cluster analysis," *Business Strategy and the Environment*, vol. 30, no. 2, pp. 1374–1388, 2021.

[4] Bappenas, "Sustainable development goals (sdgs)," 2023, accessed: 2023-07-04. [Online]. Available: https://sdgs.bappenas.go.id/

[5] M. Ahmadin, "Sociology of bugis society: An introduction," *Jurnal Kajian Sosial Dan Budaya: Tebar Science*, vol. 5, no. 3, pp. 20–27, 2021.

[6] L. S. Lamma, M. N. Massi, S. Wahyuni, Y. Widaningsih *et al.*, "Preeclampsia and normotensive pregnancy with tribal differences in south sulawesi: Comparison of serum interleukin-10 (il-10) levels," *Gaceta Sanitaria*, vol. 35, pp. S314–S318, 2021.

[7] R. Rani, N. S. Ekhsan, and R. Nasa, "Analysis of the duai boe traditional ceremony of bajo tribe in parumaan village," *Dharma Acariya Nusantara: Jurnal Pendidikan, Bahasa dan Budaya*, vol. 2, no. 1, pp. 189–213, 2024.

[8] K. W. Shum, M. Q. Ang, and S. Shorey, "Perceptions of physical activity during pregnancy among women: a descriptive qualitative study," *Midwifery*, vol. 107, p. 103264, 2022.

[9] R. Artal, "Exercise and pregnancy," in *Clinical Maternal-Fetal Medicine*. CRC Press, 2021, pp. 41–1.

[10] O. Candra, N. B. Kumar, N. K. A. Dwijendra, I. Patra, A. Majdi, U. Rahardja, M. Kosov, J. W. G. Guerrero, and R. Sivaraman, "Energy simulation and parametric analysis of water cooled thermal photovoltaic systems: energy and exergy analysis of photovoltaic systems," *Sustainability*, vol. 14, no. 22, p. 15074, 2022.

[11] J. G. Mogi, M. Premikha, O. Nabila, A. Sanjaya, I. Prihartono, and J. Gittelsohn, "Formative research to understand food beliefs and practices relating to pregnancy on kei besar island, eastern indonesia," *BMC nutrition*, vol. 10, no. 1, p. 97, 2024.

[12] D. Indriyani and L. Meria, "Influence of work environment and work characteristics on turnover intention system with mediation role of work engagement," *International Journal of Cyber and IT Service Management*, vol. 2, no. 2, pp. 127–138, 2022.

[13] M. Annas, F. A. Ramahdan, T. Handra, A. H. D. Saputra, and H. Jensen, "Application of iot and ai based on esp32cam to support sustainable mobility in smart cities," *Blockchain Frontier Technology (B-Front)*, vol. 4, no. 2, pp. 121–131, 2025.

[14] M. Murtaza, Y. Ahmed, J. A. Shamsi, F. Sherwani, and M. Usman, "Ai-based personalized e-learning systems: Issues, challenges, and solutions," *IEEE access*, vol. 10, pp. 81 323–81 342, 2022.

[15] Q. Alajmi, M. A. Al-Sharafi, and A. Abuali, "Smart learning gateways for omani heis towards educational technology: Benefits, challenges and solutions," *International Journal of Information Technology and Language Studies*, vol. 4, no. 1, pp. 12–17, 2021.

[16] G. Kassymova, A. Akhmetova, M. Baibekova, A. Kalniyazova, B. Mazhinov, and S. Mussina, "E-learning environments and problem-based learning," *International Journal of Advanced Science and Technology*, vol. 29, no. 7, pp. 346–356, 2021.

[17] C. Lukita, M. Hardini, S. Pranata, D. Julianingsih, and N. P. L. Santoso, "Transformation of entrepreneurship and digital technology students in the era of revolution 4.0," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 3, pp. 291–304, 2023.

[18] M. Rahim and I. Abbas, "The development characteristics of makassar city in past and present," *International Review for Spatial Planning and Sustainable Development*, vol. 12, no. 2, pp. 238–265, 2024.

[19] O. Jayanagara and D. S. S. Wuisan, "An overview of concepts, applications, difficulties, unresolved issues in fog computing and machine learning," *International Transactions on Artificial Intelligence*, vol. 1, no. 2, pp. 213–229, 2023.

[20] E. Tashkandi, "E-learning for undergraduate medical students," *Advances in medical education and practice*, pp. 665–674, 2021.

[21] M. H. Romli, F. Wan Yunus, M. S. Cheema, H. Abdul Hamid, M. Z. Mehat, N. F. Md Hashim, C. C. Foong, W.-H. Hong, and M. H. Jaafar, "A meta-synthesis on technology-based learning among healthcare students in southeast asia," *Medical Science Educator*, vol. 32, no. 3, pp. 657–677, 2022.

[22] O. A. Lasekan, V. Pachava, M. T. Godoy Pena, S. K. Golla, and M. S. Raje, "Investigating factors influencing students' engagement in sustainable online education," *Sustainability*, vol. 16, no. 2, p. 689, 2024.

[23] A. Yılmaz and S. Duygulu, "Developing psychological empowerment and patient safety culture: a pre-experimental study," *Journal of Basic and Clinical Health Sciences*, vol. 5, no. 2, pp. 94–103, 2021.

[24] C. Dukes, S. Dahlke, M. Pietrosanu, and M. R. Kalogirou, "Improving student nurses' perspectives towards older people with an e-learning activity: A quasi-experimental pre-post design," *International Journal of Older People Nursing*, vol. 17, no. 2, p. e12425, 2022.

[25] D. P. Lazirkha, J. Hom, and V. Melinda, "Quality analysis of digital business services in improving customer satisfaction," *Startupreneur Business Digital (SABDA Journal)*, vol. 1, no. 2, pp. 156–166, 2022.

[26] A. A. Laksono, "The impact learning organization and organization culture to employee performance, mediated by knowledge sharing (empirical study on bumitama agri ltd.)," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 2, pp. 145–156, 2023.

[27] I. W. Widana, I. W. Sumandya, I. W. Citrawan, I. N. S. Widana, F. P. Ibarra, R. F. Quicho, M. Delos Santos, J. V. Velasquez-Fajanela, and A. Mukminin, "The effect of teacher's responsibility and understanding of the local wisdom concept on teacher's autonomy in developing evaluation of learning based on local wisdom in special needs school," *Journal of Higher Education Theory and Practice*, vol. 23, no. 10, pp. 152–167, 2023.

[28] A. Hodroj, M. Ibrahim, and Y. Hadjadj-Aoul, "A survey on video streaming in multipath and multihomed

overlay networks," *IEEE Access*, vol. 9, pp. 66 816–66 828, 2021.

[29] A. Arota, A. Odja *et al.*, "The effectiveness of e-learning based on sets to improve students' critical thinking skills in optical instrument material," in *Journal of Physics: Conference Series*, vol. 1521, no. 2. IOP Publishing, 2020, p. 022061.

[30] D. Mohammed, A. G. Prawiyog, and E. R. Dewi, "Environmental management/marketing research: Bibliographic analysis," *Startupreneur Business Digital (SABDA Journal)*, vol. 1, no. 2, pp. 191–197, 2022.

[31] J. S. Alikhan, R. Alageswaran, and S. M. J. Amali, "Dingo optimization based network bandwidth selection to reduce processing time during data upload and access from cloud by user," *Telecommunication Systems*, vol. 83, no. 2, pp. 189–208, 2023.

[32] M. F. Khan, B. Hazela, D. Pandey, K. K. Singh, and S. Singh, "Design of a home server employing pcie," *International Journal of Telecommunications & Emerging Technologies*, vol. 10, no. 1, pp. 1–12p, 2024.

[33] R. McGuinness and G. Porter, "Stipulated smartphones for students: The requirements of modern technology for academia," in *Workshop on Computing within Limits*, 2021.

[34] J. Jones, E. Harris, Y. Febriansah, A. Adiwijaya, and I. N. Hikam, "Ai for sustainable development: Applications in natural resource management, agriculture, and waste management," *International Transactions on Artificial Intelligence*, vol. 2, no. 2, pp. 143–149, 2024.

[35] N. Subair, R. Haris, A. M. Ahmad Syaekhu, A. Indrawati, R. Mustari, B. Marlina, A. E. Badawi, S. S. Irma, A. Andi Hafidah, K. M. Sallo *et al.*, "Bunga rampai jagai anakta'," *Nuha Medika*, 2023.

[36] A. Maryam, A. Elis, A. Hasanuddin, M. K. Alwi, A. Syaekhu, and R. D. Nindrea, "Influence factors nutritional needs in the elderly in marginalized communities: Pengaruh faktor yang mempengaruhi kebutuhan status gizi lansia di pulau kodingareng kota makassar," *Jurnal Penelitian Pendidikan IPA*, vol. 9, no. 9, pp. 7045–7050, 2023.

[37] B. Vinaykarthik *et al.*, "Design of artificial intelligence (ai) based user experience websites for e-commerce application and future of digital marketing," in *2022 3rd International Conference on Smart Electronics and Communication (ICOSEC).* IEEE, 2022, pp. 1023–1029.

[38] N. Gurjar, "Effect of educational program on knowledge and self-care behavior among arthritis patients: Pre-experimental research design," *International Journal of Orthopaedic and Trauma Nursing*, vol. 52, p. 101038, 2024.

[39] U. Rahardja, A. Sari, A. H. Alsalamy, S. Askar, A. H. R. Alawadi, and B. Abdullaeva, "Tribological properties assessment of metallic glasses through a genetic algorithm-optimized machine learning model," *Metals and Materials International*, vol. 30, no. 3, pp. 745–755, 2024.

[40] L. Lutfi, A. Kurnia, J. Tang, and R. Haris, "Stem integrated sciencepreneurship in science learning to shape the entrepreneurial character of the z generation," *At-Tasyrih: jurnal pendidikan dan hukum Islam*, vol. 9, no. 2, pp. 316–321, 2023.

[41] Y. Shi, N. Lukomskyj, and M. Allman-Farinelli, "Food access, dietary acculturation, and food insecurity among international tertiary education students: A scoping review," *Nutrition*, vol. 85, p. 111100, 2021.

[42] N. Subair, R. Haris, and B. Badawi, "Community education on clean and healthy living behavior (chlb) due to urinary tract infections (utis) in pregnant women," *Int. J. Integr. Sci.*, vol. 3, no. 9, pp. 975–986, 2024.

[43] R. Haris, "Perubahan iklim dan kesehatan perempuan," *JEJAK PEREMPUAN*, p. 45, 2024.

[44] A. Cogels and T. De Jaegere, "To what extent can social enterprises commercializing environmentally friendly menstrual products improve menstrual health and hygiene in india," 2021.

[45] M. Setiawan, R. Widjojo, and D. Purnama Alamsyah, "Consumers' reasonings for intention to purchase natural personal care products in indonesian market," *Cogent Business & Management*, vol. 11, no. 1, p. 2289205, 2024.

[46] M. Velasco Perez, P. X. Sotelo Navarro, A. Vazquez Morillas, R. M. Espinosa Valdemar, and J. P. Hermoso Lopez Araiza, "Waste management and environmental impact of absorbent hygiene products: A review," *Waste Management & Research*, vol. 39, no. 6, pp. 767–783, 2021.

[47] M. Choudhury, H. S. Bindra, K. Singh, A. K. Singh, and R. Nayak, "Antimicrobial polymeric composites in consumer goods and healthcare sector: A healthier way to prevent infection," *Polymers for Advanced Technologies*, vol. 33, no. 7, pp. 1997–2024, 2022.

[48] S. Wicklum, E. Willis, A. Amson, K. A. McGuire, L. L. Crowshoe, K. McBrien, and R. Henderson, "A systematic literature review of physical activity-based health programs for indigenous women: impacts on physical activity levels, obesity, and community building," *Sage Open*, vol. 11, no. 2, p.

21582440211016845, 2021.

[49] L. R. Peralta, Z. Yager, and I. Prichard, "Practice-based evidence: Perspectives of effective characteristics of australian group-based physical activity programs for postpartum women," *Health Promotion Journal of Australia*, vol. 33, no. 3, pp. 891–903, 2022.

[50] K. Holliday, C. Sames, D. Hoose, and E. Wentz, "A qualitative exploration of exercise during pregnancy," *Nursing for Women's Health*, vol. 27, no. 3, pp. 190–200, 2023.

[51] M. Frazier, "Supporting pregnant people in prenatal physical activity & exercise: Brief in-service training integrating the 6 rs framework to facilitate counseling by healthcare professionals," *Doctor of Nursing Practice Projects*, 2023.

[52] F. Iradukunda, K. M. Harper, M. T. Paterno, and K. Poudel-Tandukar, "Dietary transition among sub-saharan africa women post-immigration and during pregnancy," *Ethnicity & Health*, vol. 27, no. 6, pp. 1329–1344, 2022.

[53] D. Ziso, O. K. Chun, and M. J. Puglisi, "Increasing access to healthy foods through improving food environment: A review of mixed methods intervention studies with residents of low-income communities," *Nutrients*, vol. 14, no. 11, p. 2278, 2022.

[54] Z. I. Ajwa, A. Patel, and A. Moseley, "Harnessing ai technologies: Innovations in literacy libraries for diverse learners," *International Journal of Cyber and IT Service Management*, vol. 4, no. 1, pp. 19–25, 2024.

[55] E. Waxman and K. Martinchek, "Four policies that matter for scaling healthy food access interventions," *Washington, DC: Urban Institute*, vol. 500, 2023.

[56] R. Haris, S. Haryoko, J. D. Malago, and N. Pertiwi, "Ecopreneurship ability for young women entrepreneur candidates at university," in *1st International Conference on Advanced Multidisciplinary Research (ICAMR 2018)*. Atlantis Press, 2019, pp. 465–468.

[57] M. Rakhmansyah, M. S. Hadi, S. R. P. Junaedi, F. A. Ramahdan, and S. N. W. Putra, "Integrating blockchain and ai in business operations to enhance transparency and efficiency within decentralized ecosystems," *ADI Journal on Recent Innovation*, vol. 6, no. 2, pp. 157–167, 2025.

[58] A. Lansonia and M. Austin, "The role of information management in enhancing organizational resilience," *APTISI Transactions on Management*, vol. 8, no. 1, pp. 32–39, 2024.

[59] M. R. Anwar and L. D. Sakti, "Integrating artificial intelligence and environmental science for sustainable urban planning," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 5, no. 2, pp. 179–191, 2024.

[60] J. I. Saputro, L. F. Sa'adah, Y. Syifa, K. D. Ramadhanti, and M. F. Gojali, "Transforming learning experiences with advanced educational technology solutions," *International Transactions on Education Technology (ITEE)*, vol. 3, no. 2, pp. 114–124, 2025.

[61] D. Manongga, U. Rahardja, I. Sembiring, Q. Aini, and A. Wahab, "Improving the air quality monitoring framework using artificial intelligence for environmentally conscious development," *HighTech and Innovation Journal*, vol. 5, no. 3, pp. 794–813, 2024.

[62] L. Larisang, S. Sanusi, M. A. Bora, and A. Hamid, "Practicality and effectiveness of new technopreneurship incubator model in the digitalization era," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 318–333, 2025.