ANALYSIS OF DIFFERENCES IN STUDENT KNOWLEDGE ABOUT ENVIRONMENTAL HEALTH THROUGH PROJECT BASED LEARNING: A 21st CENTURY HEALTH EDUCATION STRATEGY

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Abstract: This research is motivated by the poor quality of environmental health which is associated with high population growth and environmentally irresponsible community behavior. The purpose of this study is to determine the effectiveness of the project-based learning strategy by assigning tourism environmental health videos in Bukittinggi City as outputs or course products, as well as providing information related to differences in student knowledge before and after being given environmental health lectures using project-based learning strategies. This research uses quantitative methods with a quasi-experimental approach with a one-group pretest post-test design. The data analysis technique uses a t-test against students' knowledge about environmental health. The research instrument given is in the form of a calibrated test given before and after treatment. The sample in this study was 17 students of Bachelor of Applied Health Promotion at Prima Nusantara University, Bukittinggi taken using purposive sampling. The inclusion criteria for this study sample were students in the field of health sciences who had never taken an environmental health course. Based on the analysis of research data, there were differences in student knowledge before and after being given environmental health lectures using a project-based learning strategy. In this study, it was concluded that the project-based learning strategy with the assignment of tourism environmental health videos has proven to be effective and efficient and can be considered to improve students' environmental health knowledge.

Keywords: *Knowledge of Environmental Health, Project Based Learning, Student*

INTRODUCTION

Developing and developed countries face population problems such as high population growth, rapid urbanization, and uneven population distribution (Akhirul et al., 2020; Butarbutar et al., 2024). Indonesia is a country that is quite densely populated because of population growth which is increasing every year. Indonesia's population is growing with an average annual growth of 1.00%. This population growth rate makes Indonesia the country with the fourth largest population in the world (Yulin & Dita, 2022). Very high population growth causes many problems due to the imbalance of carrying capacity and environmental capacity that is increasingly

not ideal. This condition can cause many environmental problems that can lead to natural disasters and natural damage (Fatria et al., 2019; Priadi & Fatria, 2024; Sari et al., 2023).

A healthy environment plays an important role in creating comfort for tourists who are part of "Sapta Pesona" (Seven Enchantments) which is safe, neat, clean, cool, beautiful, friendly, and memorable (Sutrisnawati & Purwahita, 2018). Humans play a very important role in protecting the environment, so actions related to environmental health must be taken. The goal of their environmental health efforts is to achieve a healthy environmental quality, both physical, chemical, biological, and social, that guarantees the highest level of health for all. The healthy environment as intended, includes the environment of recreation areas and public facilities provided (Saraswati et al., 2016; Sriwulantari et al., 2024). Efforts to improve the quality and health of the environment in tourist places will realize a new culture of sustainable society where all members of society manage their lives based on consideration of the importance of environmental protection and preservation (Fatria et al., 2024; Sylvia et al., 2024).

In the Regional Regulation of West Sumatra Province Number 3 of 2014 concerning the Master Plan for Tourism Development of West Sumatra Province for 2014-2025, it is stated that tourism development is oriented towards environmental preservation and realizing a green economy (environmentally friendly) in every link of the tourism business chain. In addition, it is necessary to formulate regulations to maintain the carrying capacity of the environment (Nofriya et al., 2019). In line with the 3rd Sustainable Development Goal (SDGs) good health and well-being, environmental health is an important component because it will affect the degree of human health (Fatria et al., 2023; Fatria, Priadi, SN, et al., 2024). Bukittinggi as one of the icon tourism in West Sumatra Province, has superior tourist attractions, almost all of them are in the city making it easier for tourists to travel to various places (Nofriya et al., 2019). One indicator for the description of disturbances in the environmental health of tourism destinations in Bukittinggi can be seen in waste generation data in the last three years, in 2020 waste generation in Bukittinggi City reached 40,424 tons, and in 2021 waste production rose to 44,206 tons. In 2022, waste generation was only 38,238 tons (Fadhil, 2023). Although it has decreased in 2022, this number is still a warning for us to always try to live a healthy life without waste (zero waste lifestyle) especially when in public places and tourism (Fatria, 2023b). Waste management can be developed as part of tourism management. This is an important part considering that in the tourism industry, the image or impression created in the memory and feelings of tourists is the most important thing that must be maintained (Jefri & Aziz, 2018).

Based on the gaps described above, it is very important to increase public knowledge about the environmental health of tourism destinations in Bukittinggi City to achieve a balance of environmental quality balance with the quality of human life. Life today has entered the era of the 21st century where information technology, the Industrial Revolution 4.0, globalization, and the like are very important. This

century was marked by rapid change. One of the striking changes is technological advances in various fields, including education. In this context, education can be interpreted as a process of changing human behavior through the process of maturation through teaching, training, and other educational strategies (Nursyafirah et al., 2023). According to this view, 21st-century skills require research to create a learning process that is good and appropriate to creative pedagogy (Jasmine & Supriatna, 2022). Included in environmental health lectures, the use of innovative learning strategies that are by the development of the 21st century by utilizing technology and information can be used to adjust to the Merdeka Belajar Kampus Merdeka (MBKM). The challenge faced by universities in developing the MBKM curriculum is to produce graduates who have new literacy skills, namely data literacy, technological literacy, and human literacy that lead to the cultivation of noble moral characters (Mariati, 2021). The implementation of the MBKM Curriculum that can be done includes planning, learning process, assessment, and evaluation of learning (Baharuddin, 2021). This process is included in determining the use of innovative strategies such as project based learning. Based on the problems described above, researchers are interested in conducting research on the differences in student knowledge about environmental health before and after being given a strategy for based learning with the assignment of environmental health videos of tourism destinations in Bukittinggi City as products or lecture outputs.

Innovative learning strategies are learning strategies that have the potential to empower students' creative thinking. Innovative learning strategies can never be separated from constructivism which accustom students to find things independently and struggle with ideas (Fatria, 2023b). Project based learning (PjBL) is a learning strategy that is widely developed in developed countries such as the United States. Project based learning focuses on the main concepts and principles of a discipline, involves students in problem-solving activities and other meaningful tasks, provides opportunities for students to work autonomously constructing their learning, and ultimately produces valuable and realistic student work products (Fatria, Priadi, Artanti, et al., 2024; Hendriani, 2019; Nursyafirah et al., 2023). Project-based learning is the application of a constructivist approach. The stages of PjBL include (1) project identification; (2) research and design (3) development; (4) reporting; and (5) presentations (Wibowo, 2021). So this learning strategy will form student independence and student activeness in the lecture process in the syntax or learning steps passed. Students who study actively will have a good understanding of concepts because they have studied the material first before discussing it with friends and lecturers in class (Dewi, 2021; Fitriani & Sarkity, 2023; Priadi & Fatria, 2024). In addition, the application of project-based learning strategies greatly optimizes students' skills through systematic teamwork so that students can continue to strengthen, improve, test, and develop their thinking skills on an ongoing basis (Attalina, 2020). This PjBL learning strategy can also develop collaborative creativity in problem solving. PjBL aims to produce valuable work products by creating effective and fun learning (Oktaviani & Marliana, 2021).

Based on the various opinions above, it can be concluded that a project-based learning strategy is a learning strategy that is oriented to develop the abilities and learning skills of students through a series of activities to plan, carry out research, and produce certain products framed in one container in the form of learning projects. This state-of-the-art research was conducted by comparing it with previous studies that reported that project-based learning strategies are effective to apply in the 21st century. The first study successfully confirmed that there is an influence of the project-based learning model on students' collaboration skills using a one-shot case study design (Saenab et al., 2019). The next study confirmed that the project-based learning model is more effective in improving student learning outcomes compared to conventional learning models (Nusa, 2021). Finally, it was also confirmed that the implementation of the project-based learning model can improve student learning outcomes in the subject of Elementary Civics Education (Attalina, 2020). State of the art this research is related to contemporary issues of using innovative strategies in the 21st century project-based learning being associated with environmental health courses is new, and no similar studies have been found in the use of variables, locations, and research subjects.

To get novelty and the originality of the research was carried out on the assignment of making environmental health videos of tourism destinations in Bukittinggi City, carried out by students of the Bukittinggi City health cluster study program. The location of video filming was carried out in 4 tourist destinations in Bukittinggi, namely Kinantan Wildlife and Cultural Park, Fort de Kock, Panorama Park, and Wirabraja Field of Bukittinggi City. Project based learning chosen in this study because it has steps that are likely to encourage students to collaborate with other group members. In addition, related to the foundation project based learning using a constructivist learning theory approach, the application of this strategy can also be a medium for students to build knowledge from their own experience so that lectures are more scientific and logical (Fatria, 2023a; Fatria, Priadi, SN, et al., 2024; Fitriani & Sarkity, 2023). The framework in the investigation of PjBL in environmental health courses can be described as follows:

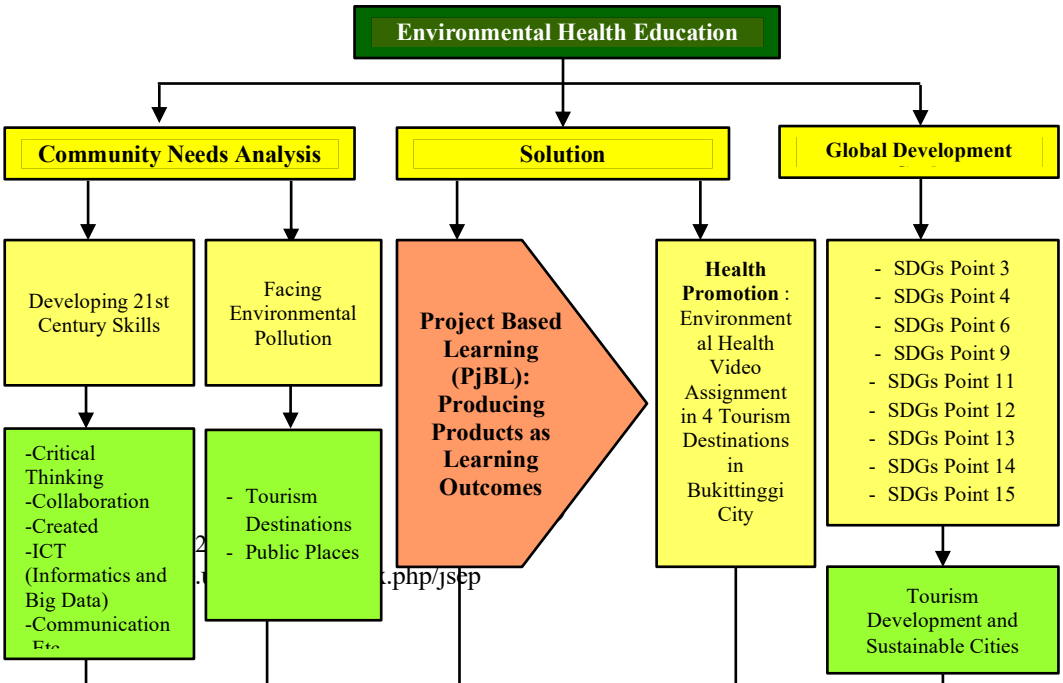


Figure 1. PjBL Investigation Framework in Environmental Health Course

METHOD

This research was carried out in the Health Promotion Study Program at Prima Nusantara University Bukittinggi from March 2023 to August 2023. Universitas Prima Nusantara Bukittinggi is located on Jl. Kusuma Bhakti No.99, Kubu Gulai Bancah, Mandiangin Koto Selayan District, Bukittinggi City, West Sumatra. This research method is a quantitative method with a experimental approach, involving 17 students selected through purposive sampling. The inclusion criteria used are students from health sciences who have never received environmental health courses.

The exclusion criteria used are students repeating environmental health courses because they got unsatisfactory grades in the previous semester and students cannot use technology and information based health promotion media. Students get experimental treatment using a project-based learning strategy with a video assignment on tourism environmental health in Bukittinggi City. Later students will be divided into 4 groups and make videos on 4 different tourism destinations in Bukittinggi, namely the Kinantan Zoo or Wildlife and Culture Park, Fort de Kock, Panorama Park, and Bukittinggi City Wirabraja Square.

Research data was collected through test instruments on environmental health knowledge through pretest and posttest. The data analysis technique used in this study was using the t-test used in comparative studies. To determine the effectiveness of using a project-based learning strategy with the assignment of health videos for tourism destinations in Bukittinggi City, to increase the environmental health knowledge of students was carried out using a single group pre-test and post-test design.

RESULTS AND DISCUSSION

This study aims to provide information on the effectiveness of implementing project based learning lecture strategies with environmental health video assignments of 4 tourism destinations in Bukittinggi City in the Applied Health Promotion Undergraduate Study Program, Faculty of Nursing and Public Health, Prima Nusantara University Bukittinggi. At the stage of preparing lecture materials, the characteristics of treatment group students become a very important consideration for the research team in addition to learning media and instructional strategies. Needs mapping was carried out by the research team before giving project based learning lectures with environmental health video assignments. The development of environmental health teaching materials is adjusted to the characteristics of students in general, namely like to use short, dense, interesting, and pictorial teaching materials, while the problems given come from the phenomenon of

environmental degradation due to the behavior of the tourist community that students see and feel every day. Thus, the resulting learning material provides opportunities for students to construct their knowledge based on facts and information obtained so that the lecture material learned will feel contextual and meaningful. Through complex activities, involving students in conducting problem-solving investigations and providing opportunities to work collaboratively in constructing knowledge, as well as producing real products (lecture outputs for environmental health promotion of tourism destinations in Bukittinggi City).

The stages in project-based learning for this Environmental Health course adopt the PjBL syntax by Abidin (2014) as shown in Figure 2. The learning stages use problems in urban tourism environmental health as the starting point for gathering and integrating various new knowledge based on real-life experiences. The stages designed for the course through independent investigation aim to help students understand the highly complex issues of tourism environmental health. Project-based learning is carried out systematically, involving students in studying complex knowledge and skills, authentic questioning, and the design of products and tasks as illustrated in the figure below.

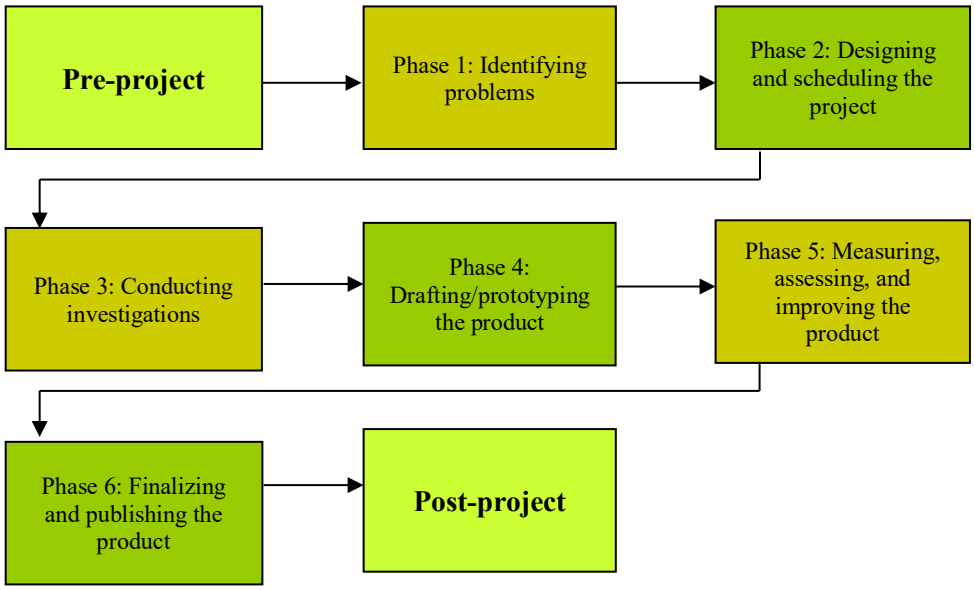


Figure 2. PjBL Syntax in the Environmental Health Course

Based on the image above, it can be explained that the stages of project-based learning undertaken in this course are as follows:

a. **Pre-project**, this stage involves activities carried out by the lecturer outside of class hours. During this stage, the lecturer designs the project description, determines the project milestones, prepares media and various learning resources, and sets up the learning conditions.

b. **Phase 1: Identifying problems**, in this stage, students observe various tourism environment objects in the city of Bukittinggi and then identify various issues such as pollution, vandalism, waste accumulation, traffic congestion, and so on, and formulate the problems in the form of questions.
c. **Phase 2: Designing and scheduling the project**, in this stage, students collaboratively, both with group members and the supervising lecturer, begin discussing the design of a tourism environmental health video project in Bukittinggi, and determine the project's work schedule.
d. **Phase 3: Conducting investigations**, in this stage, students conduct initial research as a foundation for the product they will develop. Based on the investigation, students collect data through questionnaires given to visitors and record all sanitation facilities available at the tourist sites. They then analyze the data according to its relevance to the investigation.
e. **Phase 4: Drafting/prototyping the product**, in this stage, students begin creating an initial product in the form of a video based on the plan and research findings.
f. **Phase 5: Measuring, assessing, and improving the product**, in this stage, students review the video product they created, identify weaknesses, and make improvements. In practice, measuring and assessing the product can be done by seeking opinions or critiques from other group members or the lecturer, to ensure it is suitable as a media for promoting environmental health.
g. **Phase 6: Finalizing and publishing the product**, in this stage, students finalize the video product. Once it meets expectations, the product is published on the Instagram page of the Public Health Promotion Study Program at Universitas Prima Nusantara Bukittinggi, as shown in Table 1 below.
h. **Post-project**, in this stage, the lecturer evaluates, provides reinforcement, feedback, and suggestions for improving the product developed by the students, so that it can be used by the community to gain knowledge about tourism environmental health.

The assignment of the video project for this course is carried out through several stages adapted from Pramulen et al. (2023), namely: (1) Laying Foundation, where the activities related in this stage are by conducting interviews that aim to make the process of making environmental health videos of tourism destinations by the research objectives. This video can be used as a medium for environmental health promotion to help someone change their attitude and behavior to be wiser towards the environment. Making this video is believed to be a combination of capabilities Skills 21st century in the use of technology and information and efforts to improve the quality of the tourism environment to create sustainability, interviews were conducted by meeting directly with tourism destination managers and tourists who came to Bukittinggi City tourism destinations; (2) Planning, the next activity of this video production project is planning, where the resulting process to produce video products Explainer which aims to promote environmental health of 4 tourism destinations in Bukittinggi City. Enter the production stage to produce videos that are adjusted to the data previously obtained. After production, the last stage is the

post-production stage where the video Explainer a survey has been carried out so that the videos made are appropriate and on target to promote the health of the tourism environment through social media; (3) Information Gathering, this stage students will make meaning acquisition through project-based learning outdoor, this stage will also conduct in-depth data collection, analysis, and interpretation of data through In-depth interview, observations, and documentation before finalization and upload via social media. The goal is to produce videos that are by the rules of environmental health promotion and by the provisions of the Ministry of Health; (4) Action on Finding, the last stage is to produce animated videos to carry out health promotion of the tourism environment (Pramulen et al., 2023). The video has been successfully created and published Reel Instagram the Applied Bachelor of Health Promotion Study Program class of 2022 Universitas Prima Nusantara Bukittinggi, namely: *healthpromotion_22*. For the video link produced as an output of this environmental health course, can be seen in Table 1 below.

Table 1. Product Results

Heading	Display on Instagram Reel	Source
Environmental Health at Kinantan Wildlife and Cultural Park, Bukittinggi		Link: https://www.instagram.com/reel/CwEbQsoI0DT/?igsh=MTc4MmM1YmI2Ng%3D%3D
Environmental Health at Fort De Kock, Bukittinggi		Link: https://www.instagram.com/reel/CwEaXmqoScj/?igsh=MzRlODBiNWFlZA%3D%3D
Environmental Health in Taman Panorama, Bukittinggi		Link: https://www.instagram.com/reel/CwET-lIIblF/?igsh=MzRlODBiNWFlZA%3D%3D
Environmental Health at Wirabraja Field, Bukittinggi		Link: https://www.instagram.com/reel/CwHQLdNorSr/?igsh=MTc4MmM1YmI2Ng%3D%3D

To see the effectiveness of using project-based learning with tourism environmental health video assignments, it is necessary to analyze the differences in student knowledge about environmental health materials through test instruments. The following will describe the results of research obtained based on pre-test and post-test student knowledge data.

Before being given treatment using project based learning strategies and tourism environmental health video assignments, a pre-test was first carried out to determine students' initial abilities about the course. The test instrument used is an instrument of student knowledge about environmental health concepts. The instrument was constructed by the research team themselves, taking into account various conceptual definitions of knowledge about environmental health and with slight modifications based on instruments that had been developed in other studies by Priadi et al. (2020) and Habibie (2020). Instruments were given to 17 health promotion students of Universitas Prima Nusantara Bukittinggi which could then be analyzed descriptively using SPSS 23. The description of the data obtained is as follows:

Table 2. Description of Pre-Test Data Environmental Health Knowledge

Descriptive Analysis	Value
Maximum	76
Minimum	68
Range	8
Average	71.76
Median	72
Mode	72
Variance	5.941
Standard deviation	2.437

Table 3. Frequency Distribution of Environmental Health Knowledge Pre-Test

Class Interval	Absolute Frequency	Relative Frequency (%)
68 – 69	3	17.64
70 – 71	2	11.76
72 – 73	8	47.05
74 – 75	2	11.76
76 – 77	2	11.76
Sum	17	100%

Based on Tables 2 and 3 above, it can be seen that, for the initial measurement of students' knowledge about environmental health concepts, descriptively, the students' knowledge is still not quite good. On average, students scored 71.76, with the highest interval class between 72-73 (47.05%). Therefore, by using the project-

based learning strategy treatment, an improvement in students' knowledge is expected.

After being given treatment using project-based learning strategies and tourism environmental health video assignments, a post-test was then carried out to determine the final ability of students in environmental health lectures. The test instrument used is the same instrument when measuring the pre-test, namely the instrument of student knowledge about environmental health concepts. Instruments were given to 17 health promotion students of Universitas Prima Nusantara Bukittinggi which could then be analyzed descriptively using SPSS 23. The description of the data obtained is as follows:

Table 4. Description of Environmental Health Knowledge Post-Test Data

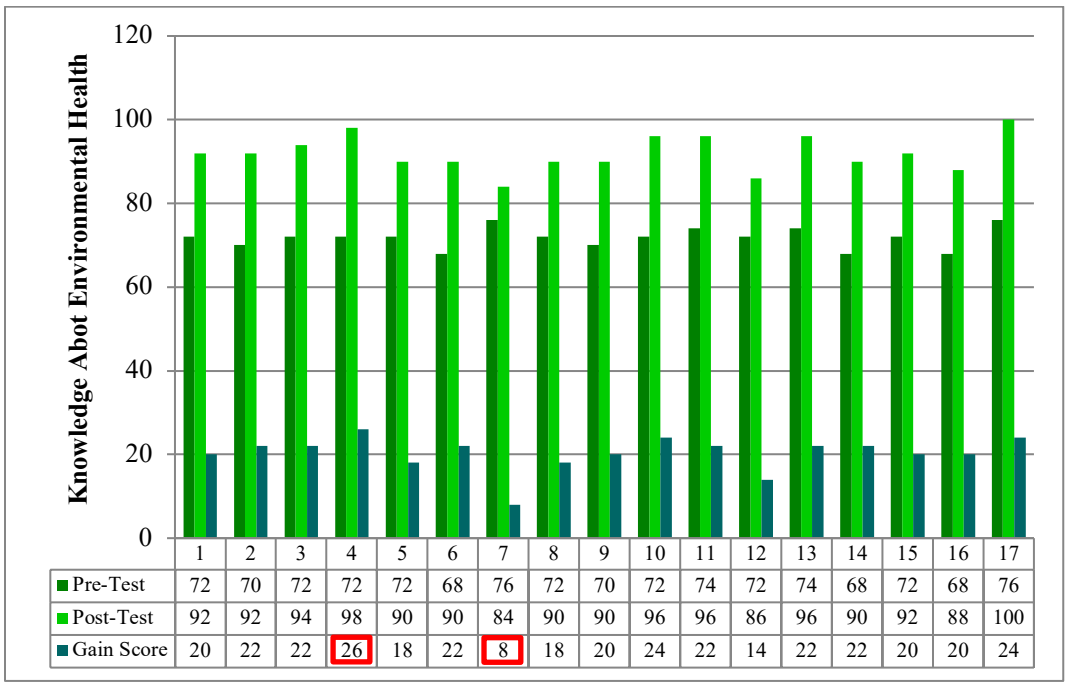
Descriptive Analysis	Value
Maximum	100
Minimum	84
Range	16
Average	92
Median	92
Mode	90
Variance	18
Standard deviation	4.243

Table 5. Post-Test Frequency Distribution of Environmental Health Knowledge

Class Interval	Absolute Frequency	Relative Frequency (%)
84 – 86	2	11.76
87 – 89	1	5.88
90 – 92	8	47.05
93 – 95	1	5.88
96 – 98	4	23.52
99 – 101	1	5.88
Sum	17	100%

Based on Tables 4 and 5 above, it can be seen that, for the final measurement of students' knowledge about environmental health concepts after being given the project-based learning treatment with environmental health video assignments at four tourism destinations in the city of Bukittinggi, the students' knowledge improved. On average, students scored 92, with the highest interval class between 90-92 (47.05%). Therefore, descriptively, the project-based learning strategy treatment has been proven to enhance students' knowledge and can be recommended as an effective strategy for use in the 21st century.

To see the real difference between the two experimental group tests (pre-test and post-test) of students' environmental health knowledge, we can see the difference in test gain score or difference between the pre-test and post-test described in the figure below.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pre-Test	72	70	72	72	72	68	76	72	70	72	74	72	74	68	72	68	76
Post-Test	92	92	94	98	90	90	84	90	90	96	96	86	96	90	92	88	100
Gain Score	20	22	22	26	18	22	8	18	20	24	22	14	22	22	20	20	24

Figure 3. Histogram Gain Score Pre-Test and Post-Test Environmental Health Knowledge

Based on the results of the calculation of gain score or the difference in pre-test and post-test data of the experimental group, a description was obtained that all students experienced an increase in environmental health knowledge between before and after being given project based learning treatment with the assignment of environmental health videos of Bukittinggi City tourism destinations with an average of 20.23. The maximum gain score is 26 and the lowest gain score is 8. Therefore, based on this gain score data, it can be said that the project-based learning strategy is effective in increasing student knowledge about environmental health. The results of interventions through project based learning treatment to increase environmental health knowledge and video output products can be seen as follows:

Table 6. Intervention Results on Knowledge Level and Availability of Environmental Health Videos of Tourism Destinations

Activities	Differences		Indicators
	Before PjBL Treatment	After PjBL Treatment	
Provide information to students about the urgency of urban environmental health education, especially in	There are still many students who do not understand the fundamental concepts of urban environmental health education, especially in tourism places and destinations.	Increasing student knowledge about fundamental concepts regarding urban environmental health education, especially in public places and tourism destinations, especially in	Transfer of knowledge and Active Discussion There was an increase in knowledge, pre-test and post-test measurements and comparisons were

Activities	Differences		Indicators
	Before PjBL Treatment	After PjBL Treatment	
tourism places and destinations.		Bukittinggi City as a provincial tourism icon. West Sumatra.	carried out.
Providing education about environmental health, public places in tourism destinations, and environmental management in order to improve the health status of the people of Bukittinggi City.	There are still many students who do not know the environmental health of public places in tourism destinations and environmental management to improve the degree of public health, including waste management of waste products for tourism activities in Bukittinggi City.	Increasing student knowledge related to environmental health information, public places in tourism destinations, and environmental management to improve the degree of public health, including zero waste life style as an environmental resolution in solving the problem of waste and waste disposal of tourism activities in Bukittinggi City.	Transfer of knowledge and Active Discussion There was an increase in knowledge, pre-test and post-test measurements and comparisons were carried out.
Provide information on distribution, agents, disease vectors and efforts to prevent environment-based disease transmission in public places and tourism, environmental pollution, radiation and impacts on human health and environmental sustainability.	There are still many students who have not learned about the distribution, agents, disease vectors and efforts to prevent environment-based disease transmission in public places and tourism, environmental pollution, radiation and the impact caused to human health and environmental sustainability to achieve SDGs (balance of human quality of life and environmental quality).	Increasing student knowledge related to environment-based disease transmission and prevention efforts both in public places and tourism destinations, environmental pollution, radiation and impacts caused by human health and environmental sustainability to achieve SDGs specifically point 3 namely Good Health and Well Being and 12th namely responsible consumption and production Especially like locals and tourists who come to travel (balance the quality of human life and the quality of the environment).	Transfer of knowledge and Active Discussion There was an increase in knowledge, pre-test and post-test measurements and comparisons were carried out.
Creating environmental health video	There are no innovative environmental health videos based on	Innovative environmental health videos based on	Independence Active and Collaborative

Activities	Differences		Indicators
	Before PjBL Treatment	After PjBL Treatment	
products with innovative tourism based on technology and information as an output of project-based learning instructional strategies.	technology and information that can be accessed by students and the wider community in tourism destinations in Bukittinggi City.	technology and information that can be accessed by students and the wider community are available on 4 tourism destinations in Kinantan Wildlife and Cultural Park, Fort de Kock, Panorama Park, and Wirabraja Field of Bukittinggi City that can be used as material for evaluation and promotion of environmental health based on the steps of developing health promotion videos by Pramulen et al. (2023).	Learning There is an output of environmental health video products for tourism destinations that can be accessed by the wider community on healthpromotion_22 Instagram reel.

The use of project-based learning in the Environmental Health course is correlated with student activities in solving various open-ended tourism environmental health issues and applying their knowledge to complete a project that results in an authentic product, such as a creative video. This learning strategy is considered effective because it is based on a scientific approach to developing new knowledge, fostering learning motivation, enhancing problem-solving skills, and encouraging students to utilize higher-order thinking skills to make decisions related to improving the quality of tourism environmental health, particularly in the city of Bukittinggi. This can certainly be seen as a novelty, as no previous research has been found using project-based learning in an Environmental Health course with assignments involving environmental health videos focused on four tourism sites in Bukittinggi. To validate the difference in student knowledge before and after the implementation of project-based learning in the Environmental Health course, a hypothesis test will be conducted.

The average test obtained during the pre-test was 71.76. During the post-test, the average (mean) obtained was 92 so the mean difference was obtained or a mean difference of 20.24. Therefore, it can be said that in general, the use of project-based learning strategies with the assignment of environmental health videos of tourism destinations in Bukittinggi City is effective in increasing students' environmental health knowledge. Before the difference test was carried out, the data group obtained had been assumed to be normal and homogeneous. Furthermore, data analysis tests using different tests (t-test) on pre-test and post-test results can be seen in the table below:

Table 7. Test Different Environmental Health Knowledge of Students Before and After Getting Project-Based Learning Treatment

Variable		SD	t	Corellation	Sig.	p-value
Environmental Health Knowledge	Pre_Test	2.437	19.978	0.314	0.219	0,000
	Post_Test	4.243				

In Table 7 above, the correlation coefficient of environmental health knowledge between before and after the project-based learning treatment was obtained at 0.314 a big number. = 0.219 > 0.05 or insignificant (ns). Furthermore, the most important result of this table is that the statistical price t = 19.978 with db = 16 and the number sig, or p-value = 0.000 < 0.05 or H_0 is rejected. Thus, it was concluded that there were differences in students' environmental health knowledge before and after being given project based learning treatment with the assignment of environmental health videos of tourism destinations in Bukittinggi City. Through project-based learning, students are encouraged to apply their knowledge and skills, and are given the opportunity to expand their understanding through problem-solving and environmental health investigations at four tourism destinations in the city of Bukittinggi. Project work is a highly challenging activity that can guide students in designing, problem-solving, decision-making, as well as conducting investigations, both in groups or independently. Project-based learning in lectures also serves as a pathway for students to achieve success from the given project potential, particularly in fostering intrinsic motivation and developing various skills and abilities, especially in the 21st century. This strategy also allows students to reflect on their own ideas and opinions, and make decisions that affect the project's outcome and the learning process in general, culminating in the presentation of the final product via Instagram. The use of social media, such as Instagram, is considered because all the students involved in this study are Generation Z, who enjoy using social media and technology in learning (Fatria et al., 2019; Fatria, Priadi, Artanti, et al., 2024).

The findings of this study are supported by several other research findings, such as Fitriani and Sarkity (2023) research which describes that implementation of project learning with the assignment of video tutorial projects, can increase interest, motivation, creativity, and 21st century skills such as thinking skills, communication skills, collaboration skills, problem-solving skills, skills in utilizing information technology, and understanding of material (Fitriani & Sarkity, 2023). The findings of this study are in line with the results of the research obtained where the strategy project based learning with the assignment of environmental health videos, can improve knowledge and skills in digital literacy of information technology utilization. Therefore, Project Based Learning suitable to be applied to the Merdeka Belajar Kampus Merdeka (MBKM), because it can equip the skills needed in the 21st century. Support is also shown by the research of Desfitri and Hastuti (2022) which describes that, the learning model project based learning able to improve students'

skills through project assignments to make students more active in solving problems in carrying out project tasks during the learning process. Students are also able to provide ideas and ideas during the vlog-making process and students are also able to realize their ideas and ideas in their project assignments (Desfitri & Hastuti, 2022). So based on the findings of this research, it is believed that the application of project learning will make students more creative, especially in terms of solving the problems faced, this is in line with the research findings obtained where the use of PjBL instructional strategies is very helpful for students in finding resolutions to solve health problems in the tourism environment which is realized through video assignments, which can also be used as a health promotion medium.

Furthermore, the findings of research by Wibowo (2021) explained that the application of PjBL with video tutorial assignments can increase interest in learning while strengthening students' creativity and confidence. The interest of students is that they like to learn by using this type of video and are also used to making tutorial-themed videos that are often uploaded on YouTube account (Wibowo, 2021). This finding supports the results of research obtained where the application of PjBL in lectures will make students feel happy because they get new experiences in terms of video production, interviewing tourists and tourism managers (doing Mini Research), and relaxing together with group friends when visiting tourism destinations in Bukittinggi City. Research from Nursyafirah et al., (2023) shows historical learning with a model project based learning (PjBL) can increase the creativity of students, especially in solving problems in the field based on each task given. The distribution of tasks to each group member can improve critical thinking or the ability to think critically of learners and boils down to improving student learning outcomes (Nursyafirah et al., 2023). This finding is also in line with the results obtained, where the use of PjBL in environmental health courses has improved learning outcomes shown by average differences in Pre-test and post-test student knowledge. Hence the use of strategies Project Based Learning (PjBL) in lectures in universities can be considered, especially in the implementation of the independent learning curriculum which also aims to shape the character and skills needed in the 21st century (Fatria, 2023b; Fatria & SN, 2024). It is hoped that through the resulting video product, it can become an educational medium that can be accessed by anyone and allow the transformation of knowledge, attitudes, and behaviors of people who are more pro-environment, as well as create a healthy environment to improve the degree of public health.

CONCLUSION

Based on the results obtained and the discussion outlined above, it can be concluded that the project-based learning instructional strategy is effective in improving students' knowledge of environmental health. Project-based learning is able to encourage students to apply their knowledge and skills, as well as provide opportunities to expand their knowledge through problem-solving and investigation. Project-based learning also allows students to reflect on their own ideas and opinions

and make decisions that affect project outcomes. Based on the findings and conclusions of this study, the following recommendations can be made: (1) University lecturers can use the project-based learning instructional strategy to enhance students' knowledge, not only in environmental health courses but also in all courses that are deemed suitable to support the implementation of the Merdeka Belajar Kampus Merdeka (MBKM) curriculum and the development of 21st-century skills; (2) For other researchers, further research should be conducted to analyze the effectiveness of the project-based learning instructional strategy involving a larger sample size or using different research methods and analysis techniques; (3) Greater efforts should be made in transforming public knowledge, attitudes, and behaviors, not only limited to instructional strategies for knowledge transfer as recommended in this study, but also other variables such as personality, morality, values, character, and insights should be empowered and considered to improve environmental quality and public health.

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