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Ecoliteracy Learning Design with Augmented Reality-Based SETS Approach for Flood Disaster Education

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ABSTRACT

Objective: : Environmental damage is strongly related to the threat of flood disasters. To reduce the impact of the risk, environmental care behavior and flood disaster education are needed in formal education. The purpose of this study is to apply Ecoliteracy learning design with an Augmented Reality-based SETS approach to increase students' knowledge about environmental care and efforts to reduce the impact of flood risk. **Method:** This study uses a mixed method of concurrent embedded design; the trial was carried out in one Class XI specialization in geography at State high school 1 Sayung. The research syntax uses the SETS (Science Environment Technology Society) approach with Augmented Reality Ecoliteracy Application media. **Results:** The results showed that AR Ecoliteracy media has an assessment score percentage of 90.46% with very good criteria, the SETS learning process with AR Ecoliteracy media can make students more interested in learning the material, but in the realm of science still needs support from teachers. The results of the Pre-Test and Post-Test paired sample tests obtained a value of Sig.<0.05. This means that this research design is effective in increasing students' knowledge, caring for the environment and efforts to reduce the impact of flood risk. **Novelty:** The use of augmented reality media is needed in education, especially with Generation Z. Research using the SETS approach in geography maple has yet to be conducted, so it can be the first step in developing this design.

INTRODUCTION

Environmental damage from human life behaviour can trigger a domino effect in various lifelines. The incompatibility of biotic and abiotic ecological management is a threat of disasters influenced by unbalanced natural factors (Nurhattati et al., 2019). The most significant complication of unfriendliness in environmental management can cause disasters, one of which is flooding. Flood disasters are usually influenced by several factors, namely meteorology, climatology, pollution, global warming, land conversion, river damage, and people's lifestyle patterns that are not based on the environment (Suhendar et al., 2023). The lack of attention to managing the environment and flood disasters both affect each other. Attention and seriousness in handling every complexity of environmental problems is the shared responsibility of all humans (Ikhsan et al., 2019).

Environmental and disaster education has been included in the Merdeka curriculum in the form of materials that include geography subjects and projects to strengthen the profile of Pancasila students (P5). The application form is adjusted to the needs of disaster mitigation knowledge, including geographical conditions and threats lurking in the surrounding environment (Kurniawan et al., 2024). In low-lying areas such as Demak Regency, there is a severe threat in the form of flood disasters. Knowledge of flood disaster education in the school environment is not just a theory, there needs to be

interactive learning to trigger a critical attitude in responding to flood disaster risk (Winatra et al., 2019).

Every flood disaster that hits is closely related to natural and environmental damage. Learning related to sustainable environmental sustainability is concentrated on students' ecoliteracy (Häggström & Schmidt, 2020). Ecoliteracy itself is an understanding that is embedded in students which is manifested in attitudes, knowledge, and skills by prioritizing environmental sustainability for survival (Koçoğlu et al., 2023). Environmental awareness in the realm of education is needed to foster environmental management habits in schools and residences (Sekaringtyas & Auliaty, 2020). The role of schools is expected to be to develop ecoliteracy learning that dedicates students to understanding the efforts for environmental wisdom. In addition, school institutions facilitate students to find out the threats, risks and impacts of natural disasters that lurk if they ignore the rules of environmental sustainability (Sudaryono & Irene, 2010).

Regarding environmental problems and the threat of flood disasters to introduce to students, there is an approach that can represent ecological and actualistic concepts, namely the Science, Environment, Technology and Society (SETS) based approach (Yu et al., 2022). Learning processes that complement each other and are connected will strengthen students' analysis of the environment science development, and technological development (Nugraini et al., 2022). The concept of ecoliteracy combined with the SETS Approach can be used to answer environmental problems and the challenges of the times (Kurniawan et al., 2024). The Science, Environment, Technology and Society (SETS) approach combines several approaches, namely the Concept Approach, process skills, Inquiry and discovery learning which are associated with environmental issues that occur in society using technology (Khasanah, 2015).

Learning about environmental and disaster materials is near to students' daily lives. The use of SETS has been applied in the research of Widyawati & Setianingsih, (2021), which utilizes the SETS approach to relate material concepts obtained in school and real life. Research from Aini et al., (2022) provides an overview of the implementation of the SETS approach in various needs, concluding that the SETS approach is a form of teaching that prioritizes the process and offers good results with a balance of knowledge, technology, and its impact on the environment and society. Learning with the SETS approach can trigger critical, collaborative, and empathetic attitudes that come from changing students' perspectives on their environment (Fitransyah & Supardi, 2022).

Related to the technology used in Ecoliteracy learning with the SETS approach, in practice, the adjustment between the demands of the times and the needs of the environment complements each other. The learning platform used to introduce students to teach the concept of ecoliteracy is necessary to make students more interested in learning it. Currently, the students we refer to as Generation Z daily lives are very close to technology and gadgets (Ramayanti et al., 2023). Based on data published by Jayani (2021) summarized in the databooks, millennial generation 4.0 students have been equipped with smartphones to support the learning process at school. In 2021, as many as 73.56% of high school students have used mobile phones to support digital-based learning. According to Prahitaningtyas (2022) learning media by utilizing technology contributes a large amount of around 52%, which can attract students' attention during learning. This data is the reason for developing technology-based media to improve students' abilities (Atminiati & Binadja, 2017).

The use of digital-based learning media that is visualized into reality, called augmented reality, can be used in ecology learning and disaster education. Augmented reality makes it easy for students to learn about environmental conditions and disasters that do not allow them to be displayed directly in the classroom (Lu et al., 2022). However, using AR can be done on each student's gadget. Interactive learning is a must that needs to be developed to support the learning of Generation Z students. The use of Augmented Reality in students needs to be introduced because it is interactive and learning becomes more fun (Setyawan, 2019). Augmented reality is a new paradigm to convey information to students through learning media that should be developed and applied (Nistrina, 2021).

Further deepening for the use of augmented reality technology in ecoliteracy learning with the SETS approach that can increase knowledge about the environment and disasters. Based on previous research from the research of Sudrajat et al., (2023) related to the use of augmented reality to help students introduce pro-environmental behavior. The research shows that the use of augmented reality media is able to make learning clearer, relevant and effective to introduce the geographical environment. Research conducted by Lampropoulos (2024) in studying environmental science shows that using augmented reality media effectively allows students to interact more with their friends and environment. It is a new experience to explore the environment and bring a deeper understanding of ecological principles. While research Sari et al., (2023); Setyaningsih et al., (2024) developed an android application with the SETS approach to introduce the topic of the solar system, learning media has been successfully developed by prioritizing contextual principles, media and the SETS approach are said to be valid and effective for use in student learning.

The newness of this study analyzes the use of augmented reality media and the SETS approach to improve the quality of learning, the effectiveness of the development of augmented reality media will contribute to the renewal of media and learning approaches in the context of environmental and disaster concerns. The purpose of this study is to describe the results of AR Ecoliteracy media validation, the implementation of ecoliteracy learning with the SETS approach and measure the effectiveness of AR Ecoliteracy media and the SETS approach to improving ecoliteracy knowledge and flood disaster education. AR Ecoliteracy media will encourage interactive, practical learning, and contribute to practitioners in the field of education. In addition, in the real world, improving environmental education and flood disaster education reduces the risk of flood disasters.

RESEARCH METHOD

Research Design

The method or design used in this study is concurrent embedded design, combining quantitative and qualitative research methods together at the same time. Research was conducted using the SETS (Science Environment Technology Society) approach based on Augmented Reality for students. The learning process uses Augmented media. The SETS approach refers to Binadja et al., (2008), Poedjiadi (2005) through five stages, namely initiation, concept formation, concept application, and assessment. The aim is to develop students' knowledge and concern for the environment and the threat of floods. The research implementation time is October-November 2023. The research location is at State High School 1 Sayung in Gemulak Village, Sayung District, Demak Regency. The samples taken were students of grades XI-3 of State high school 1 Sayung Phase F

with a major in geography. Each of these students has the potential to receive the impact of damage and the threat of flood disasters.

Research Procedure

Ecoliteracy learning design refers to the syntax of the SETS approach by Binadja et al. (1998); this stage is then developed and adjusted to the needs of learners by considering Augmented Reality Ecoliteracy media to achieve the expected learning objectives. The learning syntax can be presented according to the following image:

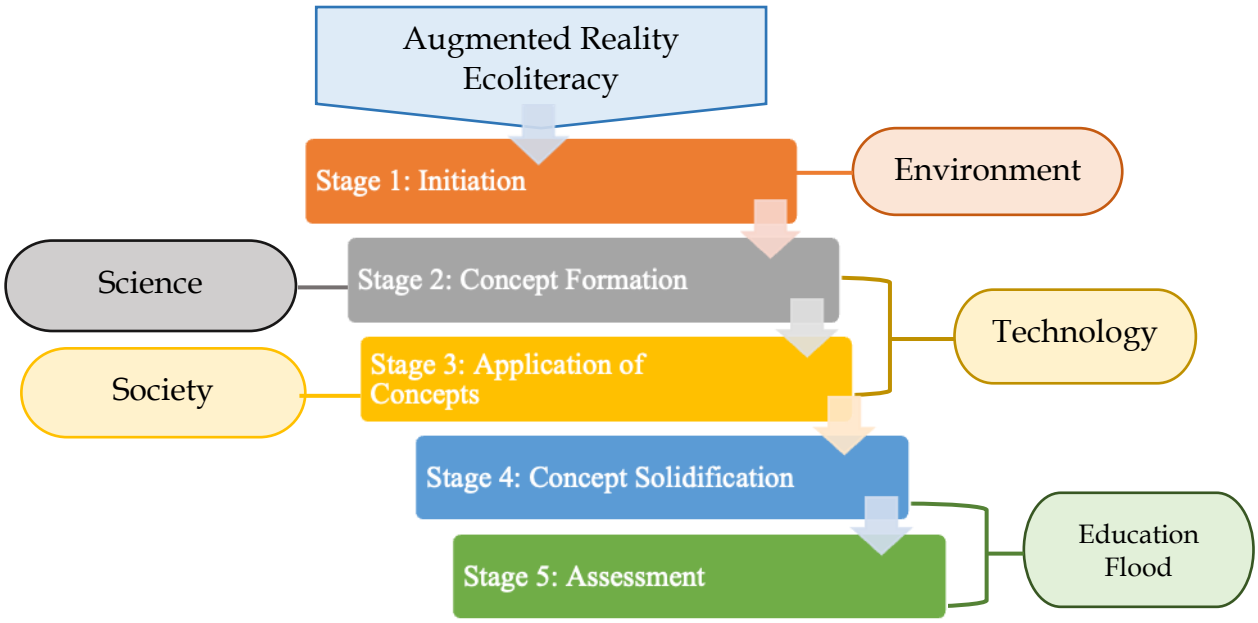

Figure 1. The syntax of Binadja's SETS learning model in Poedjiadi, (2005) has been adapted to research needs.

Data Collection and Analysis

There are three types of data collection: (1) validation of Augmented Reality Ecoliteracy media using expert, practitioner and user validation instruments. (2) learning observation sheet instrument (3) knowledge test instrument. The data analysis technique uses value intervals based on obtaining values from each indicator criterion divided by the total number of scores multiplied by 100%. The processing results are in percent form and calibrated according to criteria using the Likert scale. Further explanation can be seen in the following percentage formula and category classification:

$$\text{Percentage} = \frac{Cumulative\ results\ of\ assessment}{Maximum\ value} \times 100\%$$

Table 1. Statistical analysis for the Likert scale

Value Interval	Criteria
81.25% - 100%	Very Good
62.50% - 81.25 %	Good
43.75% - 62.50%	Enough Good
25.00% - 43.75%	Less Good

Source: Sugiyono (2019)

To measure students knowledge related to ecology and flood disaster mitigation, it is tested with pretest and post-test. The pretest and post-test results were processed using the SPSS-assisted paired sample t-test formula to determine the effectiveness of the ecoliteracy learning model with an augmented reality-based SETS approach.

RESULTS AND DISCUSSION

Results

Augmented Reality Ecoliteracy Applications

The Ecoliteracy Augmented reality (AR) application developed is an application system that supports Android phones, the main display of this application displays a menu in the form of an area map, AR animation, material explanation, practice questions and instructions for use. There are seven subjects presented, including coastal, mangrove forests, rivers and floodplains, industrial areas, residential areas, water catchment areas, and agricultural areas. Each animated display provides information related to ecological conservation and knowledge flood disaster mitigation.

The Augmented Reality Ecoliteracy application product has been validated by experts and users, the results of obtaining scores from expert and user assessments can be observed in table 2 below.

Table 2. Expert and user validation results.

Validators	Indicators		$\sum x$	$\sum xi$	Percentage
Media experts	Media design		62	64	96.87
	Software		19	20	95.00
	Advantages		14	16	87.50
		Average			***93.12***
		Result			***Very good***
Material expert	Learning Design		22	24	91.66
	Content		34	40	85.00
	Advantages		16	16	100.00
		Average			***90***.00
		Result			***Very good***
Practitioners	Learning design		15	16	93.75
	Media Display		25	32	78.125
	Software		8	8	100.00
	Content		12	16	75.00
	Advantages		7	8	87.50
		Average			***83.75***
		Result			***Good***
User	Learning design		15	16	93.75
	Media Display		31	32	96.875
	Software		8	8	100.00
	Content		14	16	87.50
	Advantages		8	8	100.00
		Average			***95.00***
		Result			***Very good***
Average validation results					**90.46**
Validation result criteria					**Very good**

Based on the assessment of the validation results, media experts obtained a percentage score of 93.12% with very good criteria, assessment by material experts

92.22% with very good criteria, practitioner assessment 86.87% with good criteria and user assessment 95.62% with very good criteria. The average percentage score is 91.95% with very good criteria. Thus, the overall application of augmented reality ecoliteracy is very feasible to be used in the learning process.

Data from validation by experts, practitioners and users are used as determinants of the next step in taking action, according to Prismanata & Ismaniati (2017) research on obtaining high scores when validation of a design or product is an important consideration before using it in learning. as explained by Abdillah et al., (2023) the results of learning media validation are matured from the beginning so that learning outcomes are not constrained again, tools that are not ready need to be improved until they are smooth and meet the minimum criteria to be used.

SETS Learning Process

Basically, SETS learning is an adaptation of SETS vision learning by Binadja (1998) which has been developed by Susilo et al., (2015), Rini (2017), Fitransyah & Supardi (2022) in science-based education and science. The use of the SETS vision learning approach developed in social-based learning requires adjustment and research. This is related to the conformity of the steps with the learning objectives. This study intends to educate students about ecoliteracy, which is a form of concern for the environment and its relation to flood disaster education. The goal of the destination school is to have the complexity of student conditions and the environment that supports the learning process with this SETS approach. The condition of school is a coastal area with complex environmental damage and the initial condition of students who have a low level of environmental literacy. The use of augmented reality will trigger students' interest in learning material on basic environmental competencies in class XI.

Learning is carried out through five stages as contained by Poedjiadi (2005) with added development according to the needs of researchers. The results of observations of activities at each meeting 1-3 can be seen in the Figure 2.

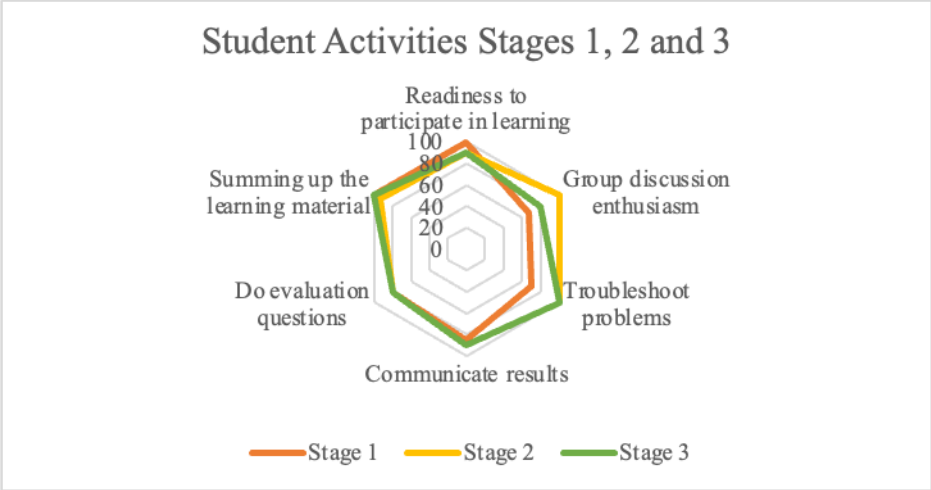

Figure 2. Comparison of activities of students stages 1-3.

According to Figure 2. Spider web diagram showing the results of observations of student activities. At the first meeting, some aspects were in the lowest line circle. Among them, the lowest in the aspect of enthusiasm for group discussions and aspects

of solving problems. At the first meeting, the students need to adjust to the learning process that takes place. It is known that the level of literacy and learning motivation of students at State high school 1 Sayung is relatively low (Febriana, 2021). Teachers have a considerable role in supporting the learning process in the classroom, especially when learning new things. In the second meeting, the student learning activity process increased in terms of enthusiasm for group discussions. This is influenced by the use of augmented reality applications in the learning process. Next, at the third meeting, the level of enthusiasm of students decreased. However, in other aspects, it has not changed much. With an average score above 80%, this shows that the learning process until the third meeting went very well using an augmented reality-based SETS approach.

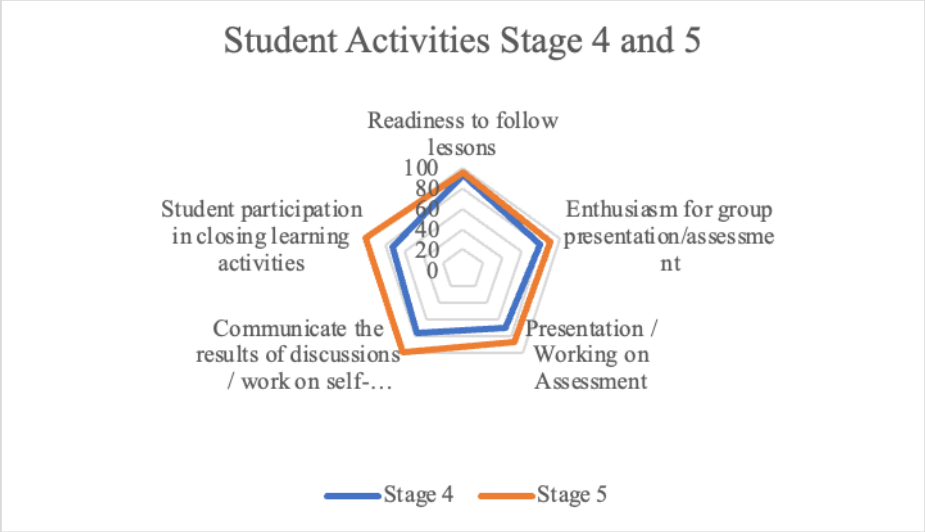

Figure 3. Comparison of activities of stage 4-5 students.

In the process of student activity in stages 4 and 5 learning, there are differences in results in almost every aspect. The circle of results of the fourth meeting is lower than the circle of scores at the fifth meeting. The difference in values is quite clear in the aspect of communicating the results of discussions and the aspect of doing self-reflection. Then, in the aspect of participation, closing learning activities has a significant difference. In the fourth meeting, students focused on communicating the results of worksheets that had been done during the previous meeting stage. It takes effort and communication skills to convey the results of group discussions. Students still need direction in the collaboration process, but in the development of ecoliteracy materials for flood mitigation, they can present well. However, in this case, the teacher must also clarify if there is a misunderstanding among students when delivering the material. Meanwhile, in the fifth meeting, the focus of learning activities on the assessment process was in the form of knowledge assessment and self-reflection.

The description of each stage of ecoliteracy learning with the SETS (Science Environment Technology Society) approach based on Augmented Reality is further explained as follows:

1. *Initiation*

The first stage of this learning is initiating, At the beginning of learning, students are directed to observe things around them. Sensitivity to the environmental conditions around their lives is an initial form of ecological literacy to know interest and concern

for the environment (Brewer et al., 2013; McBride et al., 2013). Ecoliteracy learning applied by students is very close to their daily lives (Kusumawardani et al., 2023). For example, students are faced with polluted environmental conditions and threatened with damage. Namely areas that are adjacent to many industries and are in coastal areas that experience abrasion, of course, this is a serious environmental problem but needs knowledge and awareness from an early age (Nadiroh et al., 2019). Students find many environmental problems around them, and they need to group these types of environments to find out the causes and solutions to the many environmental damages they face. This ecoliteracy learning is familiar to them. Because, in essence the concept of ecoliteracy is very necessary for them to take one action step to save the environment where they live.

2. *Concept formation*

The concept formation stage is the process of identifying and discovering new knowledge from the process of observing in the previous stage. In this stage, students are led to discover new things related to the concept of SETS (Science, Environment, Technology, Society). The initiation stage and the concept formation stage are interrelated; that is, the results of observations of the surrounding environment (ecology) are broken down into each SETS concept. This breakdown function itself is to trigger students' logical thinking when facing a problem in their lives (Diyah Nur Rahmawati et al., 2022). Ecoliteracy learning with an augmented reality-based SETS approach leads students to investigate and discover for themselves each object that appears in augmented reality media. Students open the AR Ecoliteracy application on each of their Android gadget devices. According to (Binadja et al., 2008) when breaking down the findings of environmental problems they face (Environment), traced and presented in the form of AR technology (technology), and analyzed the impact on people's lives (Society) and solved some of these problems with logical science concepts (Science). The concept of this SETS approach is able to examine one by one to facilitate students' understanding of facing and solving environmental problems around their homes (Susilo et al., 2015).

Ecoliteracy learning with an augmented reality-based SETS approach is carried out by students when learning in class with a group system. The use of augmented reality ecoliteracy media helps students understand a problem that is beyond their reach. As in understanding polluted coastal conditions, industrial waste disposal can affect ecology and damage environmental sustainability. The results of the appearance of the media can be seen in the following picture:

Figure 4. AR Ecoliteracy Display (coastal, industrial and mangrove).

3. Application of concepts

Concept application is the stage to corroborate concepts that have been discovered before. The use of augmented reality ecoliteracy media at this stage is a way to introduce students to the environment and the threat of the environment if the environment is damaged. Students are invited to analogize from previous findings that natural damage, such as water catchment areas, rivers, and mangroves, will trigger a threat of natural disasters, one of which is flooding. Strengthening concepts in environmental materials and mitigating natural disasters as a form of a series of natural phenomena that need to be followed up, both related to structural and non-structural risk reduction and community participation (Rahma, 2022). According to Juhadi & Herlina (2020), disaster mitigation education efforts carried out in schools introduce students to the threat of disasters that lurk in their living environment, and this knowledge becomes the basis for making decisions in dealing with disasters. At this stage, learning has focused on deepening the problem of environmental damage attributed to the concept of science. Then, it is thoroughly reviewed to overcome and reduce disaster risk.

Learners so far know that the flood disaster that hit them is purely a natural factor, and humans have no contribution to controlling nature. However, Ecoliteracy learning is taught to manage nature wisely in the hope of reducing disaster risk. Limited images related to the concept of flooding can be presented in more real visuals in classroom learning. Students are asked to observe augmented reality ecoliteracy animations to learn natural cycle patterns and reduce the impact of flood risk.

Figure 5. AR view of settlements before and after flooding.

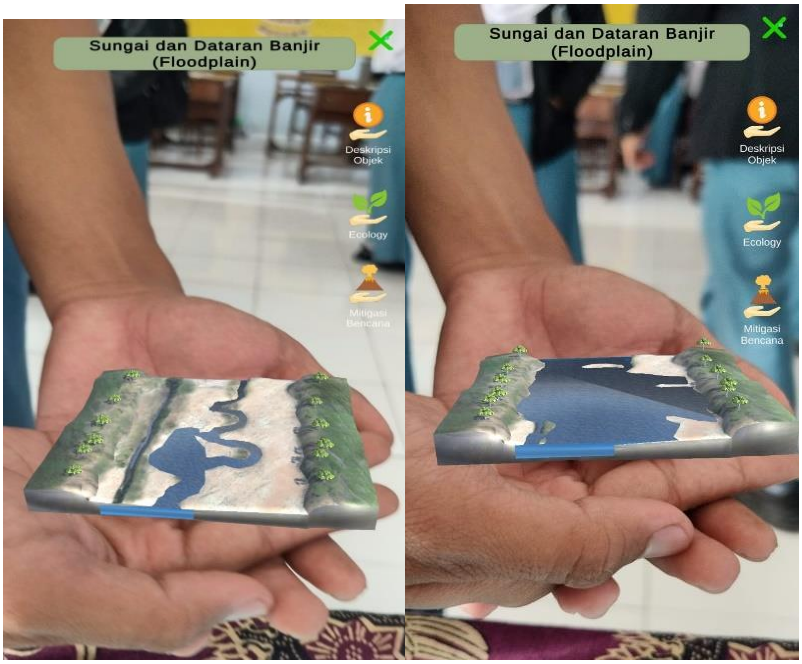

Figure 6. DAS AR display before and after overflow.

For example, in residential areas, houses with high foundations and houses on stilts are recommended as an effort to reduce disaster risk. In residential areas that are often flooded, it is recommended to have level houses or houses on stilts to secure goods. While in the watershed area, so as not to use the floodplain area to build buildings and gardening because this will be quite risky when the rapid flow spills into the floodplain and disrupts the function of the watershed system.

4. *Solidification of concepts*

The concept solidification stage is basically students conducting a review to ensure the concepts that have been found and learned by students do not violate the original concept. Students communicate the findings of group discussions, and then all listen,

especially teachers who understand the course of learning concepts. A material presentation will require students to criticize each other's findings of the concept (Salawane et al., 2020). Sometimes, limitations or differences in understanding a topic will result in a concept that is different from the original concept. This stage is very important for realigning these concepts by presenting the results that have been found, then seeking truth and drawing conclusions from the previous process together. The role of the teacher is very important, and it is important to listen in sequence from the presentation of each group. At this stage, accuracy in listening is needed. In addition to teacher involvement, other students have a role in examining the concepts presented by the presentation group. This is because the involvement of everything is needed to underline the appropriate and inappropriate concepts of the topic presented.

5. *Assessment*

The final stage is assessment. The assessment process is carried out to determine the results of learning activities (Sagita, 2023). Assessments are in the form of assessments, knowledge tests, and self-reflection. The knowledge test becomes a quantitative measurement tool and will appear as face value as a criterion with a definite value. At the same time, self-reflection is assessing oneself based on the understanding of what the student learns. Usually, self-reflection will show the material that most imprints on students and things that will be done by students in the future. Of course, self-reflection will show the learners' own reality. The formative test presented was a multiple-choice test of material related to ecology and flood disaster mitigation. The test results are used to analyze students' level of knowledge in understanding the concept of ecoliteracy and knowledge of flood disaster education.

Pre-test and Post-Test Scores of Learners

Data analysis techniques in this study used a pre-test and post-test system with one design group. There is only one class of experiments with the Quasi-experimental system. The normality test used was Kolmogorov Smirnov and Shapiro-Wilk to test the effectiveness of learning design using paired sample T-Test. The results of the normality test analysis can be seen in Table 3.

Table 3. Pre-test and post-test results.

		Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Value Type	**Statistic**	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Value learning outcomes	Pretest	.14	35	0.06	.95	35	0.12
	Posttest	.08	35	0.20	.97	35	0.59

Source: research data processing

Pre-requisite test results to determine normality test using Kolmogorov Smirnov and Shapiro-Wilk with a sig level of 0.05. Pretest and post-test analysis results were obtained with a sig value of > 0.05, thus H0 was rejected and H1 was accepted. So it can be said that the data is normally distributed. Meanwhile, the results of the effectiveness of ecoliteracy learning design with an augmented reality-based SETS approach were determined using a paired sample test t-test, which can be seen in Table 4.

Table 4. Paired samples t test.

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pretest Posttest	--20.60	12.55	2.12	-24.91	-16.28	-9.70	34	0.00

Source: research data processing

Based on the Table 4, pre-test and post-test using t-Test obtained a sig value (2-tailed) of 0.00 with effective interpretation if the value of sig.<0.05 which means that ecoliteracy learning design with an augmented reality-based SETS approach is effectively used to increase students' knowledge related to ecology and flood disaster mitigation.

Discussion

The results of the study showed that the Augmented Reality Ecoliteracy design had an average score of 90.46% with very good criteria. The AR Ecoliteracy application is feasible to use for learning media. Augmented reality media ecoliteracy provides a new experience for students to learn something abstract becomes real (Ati et al., 2022; Velázquez & Méndez, 2021). The development of augmented reality media in education can increase students' knowledge to solve environmental problems (Mubarok et al., 2020). The newness of technology from augmented reality presented in the classroom provides more learning opportunities because space and time limitations are not obstacles for teachers and students (Priyanto & Sumarwan, 2023).

Based on the analysis of the data of the table of paired sample test results, pre-test and post-test using t-test obtained a sig (2-tailed) value of 0.00 with a practical interpretation if the value of sig.<0.05, which means that the ecoliteracy learning design with the augmented reality-based SETS approach is effectively used to increase students' knowledge related to ecology and flood disaster mitigation. The use of augmented reality with the SETS approach to implementing environmental care and environmental solutions by Perdana & Rosana (2023) through four stages, namely needs identification, media and activity design, development for validation and distribution of research results. Research on the use of Augmented Reality for environmental recognition can present quite varied information from early education to higher education (Samala et al., 2023; Alfitriani et al., 2021). Ease of use and attractive visualization can animate learning to be closer to the natural environment which can be observed in detail (Badilla-Quintana et al., 2020).

Findings related to the SETS approach to augmented reality-based Ecoliteracy learning design provide an overview of the process of implementing activities to the effectiveness of their implementation. The identification of the researchimplementation process includes (1) students being able to find environmental problems around them, (2) students are more interested in learning flood disaster mitigation materials, (3) students solve problems scientifically based on the source of the problem and its impact further in the future. (4) students can utilize technology in the field of education in accordance with the demands of the times. (5) forming an attitude of concern for the

problem of disaster threats that occur in the community. (6) measuring student learning outcomes with the SETS approach applied to students with social studies backgrounds. (7) creating a learning method that is more friendly to students' backgrounds and measuring students' unexplored knowledge (Khoirunnisaa' et al., 2022; Widyawati & Setianingsih, 2021; Hairida, 2017).

The success of ecolitearacy learning with the Augmented Reality-based SETS approach can be proven from the development of students in interpreting the importance of preserving nature, reducing environmental pollution and behavior that can increase the threat of flooding, familiarizing the use of technology as an effort to adapt to the times (Zakaria et al., 2021). Increasing knowledge of environmental concerns and helping to know more about flood disaster mitigation. Knowledge is essentially a valuable investment to support sustainability education. The further impact of Ecoliteracy learning with the Augmented Reality-based SETS approach will be able to increase ecological literacy in education and reduce the number of flood risks.

CONCLUSION

Fundamental Finding : The results of this study show that AR Ecoliteracy media is suitable for use as a learning medium to introduce environmental awareness and disaster mitigation knowledge. There has been an increase in students' understanding of the concepts of eco-literacy and flood disaster mitigation. We are able to attract students using augmented reality ecoliteracy technology for geography learning activities as a form of adjustment to the needs of the times. Able to optimize flood mitigation efforts in flood-prone areas in student neighborhoods. **Implication :** This research can have implications for students by utilizing AR Ecoliteracy media as a means of disaster mitigation in the school environment and outside the school. It also contributes to reducing environmental quality degradation and disaster reduction. **Limitation :** The learning design in this study has the characteristics of disaster-prone areas and high levels of environmental damage. Need adjustments in applying similar learning designs. **Future Research :** The lack of use of the SETS approach in the social realm, especially in geography subjects, can be redeveloped by further research related to SETS learning design to expand studies in geography education.

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