



Preserving Local Wisdom through Subak Analogy Videos for Teaching Computer Network Concepts

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Abstract

This study aims to identify the usefulness of subak analogy videos for learning computer network concepts and to analyze the effectiveness of their use based on students' experiences and understanding. This study uses a qualitative approach with a naturalistic type. Data were collected through observation, in-depth interviews, and documentation of 43 vocational high school students studying computer network concepts. Data analysis was carried out using the Miles and Huberman model, which includes data reduction, data presentation, and concluding. The study results showed that subak analogy videos were beneficial for students in understanding computer network concepts. Students expressed that subak analogies provide a concrete picture of data flow in computer networks, making them easier to understand than conventional approaches. In addition, data analysis showed increased student understanding, as demonstrated by their reflections in discussions and problem-solving based on computer network concepts. These findings indicate that using subak analogy videos can be an effective learning strategy in improving students' understanding of computer network concepts.

Keywords: Analogy Video; Computer Network; Naturalistic Learning; Subak

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INTRODUCTION

Computer networks are one of the subjects included in the basic skills program (C2) that must be mastered by students. Learning computer networks in schools should emphasize a contextual approach, not just text-based (Wijayanti et al., 2020; Moghadas et al., 2023; Awoke et al., 2025). Interaction between students and the objects being studied is very important in this learning, because it can provide opportunities for students to develop rational thinking skills, analytical skills, and problem solving (Chumba et al., 2020; Trisahid et al., 2024; Marwoto et al., 2024). However, in practice, computer network learning still tends to be teacher-centered, so that students have difficulty understanding abstract concepts. The analogy approach helps students understand abstract concepts by comparing two objects or

phenomena that have similarities (Wijayanti et al., 2020; Isaeva et al., 2025; Siddique et al., 2025). This strategy connects new concepts with the knowledge that students already have (Win & Wulandari, 2023; Asmororini et al., 2024; Jumaera et al., 2024). Various studies have shown that analogies can improve understanding in various fields of science (Fatonah & Wicaksana, 2023; Riberio, 2023; Socrates et al., 2023). To support its effectiveness, multimedia-based media such as videos can be used (Uyuni & Af'idah, 2023; Gestiada et al., 2025; Ruiz & Gallagher, 2025). Videos make learning more interesting, interactive, and make it easier for students to understand complex concepts.

One concept in local culture that has similarities with computer networks is the subak irrigation system in Bali (Farikhah, 2017; Jubba et al., 2023; Schwartz et al., 2023). Subak is a traditional irrigation system used by the Balinese people to regulate the flow of water to the rice fields collectively and in a structured manner (Bukoye & Abdurahman, 2023; Sirait & Ratti, 2024). This system has a working principle similar to a computer network, where the flow of information in the network can be likened to the flow of water in the subak system (Perrotta et al., 2017; Majeed et al., 2024; Philogene et al., 2024). Thus, the concept of subak can be used as an analogy in learning computer networks to help students understand this concept more easily.

Based on the results of initial observations conducted at one of the vocational schools in Bali that studies the concept of computer networks, it was found that students had difficulty understanding the concept of computer networks, especially in terms of data distribution, network topology, and the working mechanisms of the network system. This can be seen from the low participation of students in class discussions and the results of the initial test which showed a weak conceptual understanding. In addition, the learning that takes place is still textual and teacher-centered, so that students tend to be passive and less actively involved in understanding the abstract concepts taught. Based on these findings, a more contextual and interesting learning approach is needed, such as the use of local culture-based analogies in the form of learning videos, so that students can more easily understand the concept of computer networks in a more concrete and applicable way.

Previous research has Resiani & Sunanjaya (2020) also shown that the analogy approach can improve students' understanding of abstract concepts. The use of analogies in learning can activate students' prior knowledge and improve their understanding of the concepts being learned (Mengistu & Gebeyehu, 2020). Natural resource-based analogies can increase students' interest in learning and understanding of human anatomy material (Djudin & Grapragasem, 2019). Although these studies prove the effectiveness of analogies in learning, most still use analogies from common objects and have not integrated local culture as a source of analogy in technology-based learning.

This study has a novelty in the learning approach by integrating local wisdom, namely the subak irrigation system from Bali, as an analogy in computer network learning. Not only using verbal analogies or static images, this study develops a learning video based on subak analogies to help students understand computer network concepts more easily and contextually (Wang & Li, 2022; Berou et al., 2024; Redulfin et al., 2025). In addition, this research approach uses a naturalistic qualitative method with Miles and Huberman data analysis, which provides an in-depth understanding of how students process computer network concepts through local cultural analogies.

Although previous studies have shown that analogies are effective in improving conceptual understanding, there is still a gap in the integration of local culture-based analogies in technology learning (Mackay & Alkirwi, 2014; Chou et al., 2022; Kwon et al., 2025). Most previous studies have used analogies from scientific concepts or everyday objects, without considering the potential of local wisdom as a source of analogies that can provide a more meaningful learning experience for students (Erkkila et al., 2023; Rasdia, 2024; Mokoginta & Mokwena, 2024). In addition, research on computer network learning has rarely used a naturalistic qualitative approach to explore students' experiences in understanding the concept. Therefore, this study attempts to fill this gap by developing and analyzing the effectiveness of subak-based analogy videos in improving students' understanding of computer network concepts.

RESEARCH METHODS

This study aims to identify the usefulness of subak analogy videos in learning computer network concepts and analyze the effectiveness of their use based on student understanding. The research design uses a qualitative approach with a naturalistic research type. This method was chosen because the research was conducted in natural conditions without variable manipulation, so that it can explore students' experiences more authentically (Vireak et al., 2025; McIntyre-Mills et al., 2023). The subjects in this study were vocational high school students in Bali who were studying the concept of computer networks. This study involved one of the teachers who taught computer engineering and networking at a vocational high school in Bali and involved 43 students who were selected based on purposive sampling techniques, considering that students had received computer network material but still had difficulty understanding it.

The research procedure can be seen in Figure 1 below.

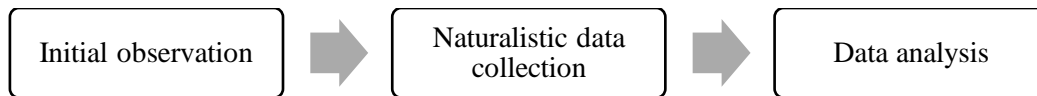


Figure 1. Research procedure

The research procedure in Figure 1 above consists of three main stages (Al-Momani et al., 2024). The first stage is initial observation, which aims to identify problems in learning computer network concepts and understand the initial conditions of students before being given treatment. The second stage is naturalistic data collection, where data is obtained through qualitative methods such as interviews, direct observation, and documentation without direct intervention from researchers, thus describing learning conditions naturally. The last stage is data analysis, which includes data reduction, data presentation, and drawing conclusions to evaluate the effectiveness of using Subak analogy videos in improving students' understanding of computer network concepts.

The research data was obtained through observations during the learning process, interviews with students and teachers, and analysis of student learning outcome documents. The instruments used included interview guidelines, observation sheets, and student reflection notes on the use of analogy videos in understanding computer network concepts. The following is a grid of the observation sheet instrument in table 1 which is sourced from Cadiz et al. (2024).

Table 1. Observation Sheet Grid

Observation Indicators	Description	Measurement Scale
Student participation in learning	Students' activeness in discussions and answering questions	1 = Not active, 2 = Less active, 3 = Quite active, 4 = Active
Understanding of computer network concepts	Students are able to explain concepts after watching the subak analogy video	1 = Don't understand, 2 = Less understand, 3 = Quite understand, 4 = Understand
Student responses to the use of analogy videos	Students' interest in learning using videos	1 = Not interested, 2 = Less interested, 3 = Quite interested, 4 = Very interested
Student interaction with teachers	How often do students ask questions or provide responses	1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often
Student involvement in learning activities	Participation in exercises or assignments related to the material	1 = Not involved, 2 = Less involved, 3 = Quite involved, 4 = Very involved

Next, there is a grid of interview sheets conducted with students (Chen & Jian, 2024), which can be seen in table 2 below

Table 2. Grid of Interview Sheets for Students

Questions	Objectives	Answer Type
What do you think about learning computer networks before using the Subak analogy video?	Explore students' early experiences	Descriptive
Does the Subak analogy video help you understand the concept of computer networks? Explain!	Assess the effectiveness of analogy videos	Descriptive
Which part of the video helped you the most in understanding the concept? Why?	Identify video elements that contribute significantly	Descriptive
What challenges or difficulties did you face in understanding the concept of computer networks through this video?	Identify barriers to learning	Descriptive
Do you feel more interested in learning computer networks after using the Subak analogy video? Explain!	Assess students' learning motivation	Descriptive

Interviews were also conducted with the teachers concerned (Chen & Jian, 2024), table 3 shows the outline of the teacher interview sheet

Table 3. Interview outline for teachers

Questions	Objectives	Answer Type
What methods have you used so far in teaching computer networks?	To understand previous teaching methods	Descriptive
Do you see any changes in students' understanding after using the subak analogy video? Explain!	To assess the impact of video on students	Descriptive
In your opinion, how effective is the use of local culture-based analogies in teaching computer network concepts?	To explore teachers' views on analogy-based learning	Descriptive
What challenges do you face when integrating analogy videos into your learning?	To identify barriers to using video in the classroom	Descriptive
Do you plan to use similar methods in other learning? Why?	To explore the potential for future implementation of this method	Descriptive

In this study, data analysis was conducted using the Miles and Huberman interactive model consisting of three main stages: data reduction, data presentation, and drawing conclusions (Mulugo, 2020). Data reduction was carried out by sorting, simplifying, and selecting relevant data from the results of observations, interviews, and documentation (Marshall & Simpon, 2014; Karami et al., 2020; Rachmawati et al., 2023). At this stage, data that was not directly related to the focus of the study was eliminated to ensure the clarity and integrity of the information obtained. Furthermore, data presentation was carried out in the form of descriptive narratives, tables, and interview quotes to provide a clear picture of the research results. Data from observations were analyzed by identifying patterns of student participation and understanding, while interview data were analyzed using a categorization method based on the main themes that emerged in student and teacher answers.

The last stage is drawing conclusions and verification, where the main findings from the data that had been reduced and presented were further analyzed to obtain valid conclusions (Jeon et al., 2024). The validity of the data was checked by triangulating sources and techniques, namely comparing the results of observations, interviews, and documentation to ensure the consistency and validity of the data collected. With this approach, the study can produce accurate findings regarding the effectiveness of the subak analogy video in improving students' understanding of the concept of computer networks.

RESULTS AND DISCUSSION

After obtaining the results of observations on 43 students at SMK Bali regarding student responses to the preservation of local wisdom through the analogy video of subak for teaching computer network concepts, the data obtained was analyzed. The following is presented in Table 4.

Table 4. Results of Observation Analysis

Observation Aspect	Indicators	Observation Results	Description
Student Engagement	Activity in discussion	63% of students actively asked and answered questions	Students show interest in learning using subak analogy videos
Conceptual Understanding	Ability to re-explain computer network concepts	48% of students were able to explain concepts better after watching the video	Understanding increases compared to before learning
Response to Media	Enthusiasm when watching videos	77% of students appeared focused and interested while the video was playing	Video media is effective in attracting students' attention
Interaction with Teachers	Students ask questions or seek clarification	55% of students actively asked questions to deepen their understanding	Shows reflection and curiosity about the material
Ability to Analyze	Connecting the concept of subak with computer networks	56% of students were able to identify similarities between the two concepts	Indicators that analogies help understanding abstract concepts

Based on the observation results, students showed high involvement in learning using the subak analogy video. Students were active in discussions, showed better understanding after watching the video, and were more enthusiastic in interacting with the teacher. Most students were able to connect the concept of subak with computer networks, which shows that the analogy approach helps them understand abstract material.

Furthermore, to support this finding, the results of an interview study with several students at SMK Bali regarding local wisdom through the subak analogy video for teaching computer network concepts have been reduced so that the results can be seen in Table 5 below.

Table 5. Results of student interview data reduction

Questions	Student Answers (Data Reduction Results)
What do you think about learning computer networks before using the Subak analogy video?	Before using the video, the computer network material felt difficult and abstract. Many technical terms were difficult to understand and there was a lack of real images.
Does the Subak analogy video help you understand the concept of computer networks? Explain!	Yes, the video helped because the concept of computer networks was explained with a familiar analogy, namely the

Questions	Student Answers (Data Reduction Results)
Which part of the video helped you the most in understanding the concept? Why?	subak irrigation system. This made it easier for me to understand how computer networks work. The part that explains how water flows in a subak is analogous to data flow in a computer network. This helped me understand how data flows in a network system.
What challenges or difficulties did you face in understanding the concept of computer networks through this video?	There were some technical terms that remained difficult to understand despite the analogy. In addition, the limited duration of the video made some explanations feel fast and needed to be repeated.
Do you feel more interested in learning computer networks after using the Subak analogy video? Explain!	Yes, I felt more interested because learning became more fun and easier to understand. The video also made the concept of computer networks more relevant to everyday life.

Based on the interview results, the majority of students had difficulty understanding computer networks before using the subak analogy video. They felt that this material was too abstract and difficult to imagine. However, after using the analogy video, they admitted that it was easier to understand the concept of computer networks because of the relationship with the subak system that was already familiar to them. The most helpful part of the video was the analogy between the flow of water in a subak and the flow of data in a computer network, which provided a concrete understanding of how data moves in a network. However, some students still had difficulty understanding technical terms and felt the need to repeat the video to gain a deeper understanding. Overall, students showed an increased interest in learning computer networks after using the subak analogy video. They felt that this method was more interesting and relevant compared to the more theoretical conventional approach.

Furthermore, an interview was also conducted with one of the teachers who teaches computer engineering and networking at SMK Bali. The following is the interview results in Table 6.

Table 6. Teacher interview results

Questions	Teacher's Answer (Data Reduction Results)
What methods have you used so far in teaching computer networks?	So far, the methods used are lectures, discussions, and direct practice in the laboratory. However, there are still obstacles in understanding the theory before practice.
Do you see any changes in students' understanding after using the subak analogy video? Medium	Yes, there is an increase in student understanding. They grasp the concept of networks more quickly because of the analogy of subak.
In your opinion, how effective is the use of local culture-based analogies in teaching computer network concepts?	Very effective, because students are more interested and feel the concept is more relevant to their daily lives. The analogy makes it easier for them to connect theory with real applications.
What challenges do you face when integrating analogy videos into your learning?	The challenge is the limited time in connecting analogies with more complex technical concepts and the readiness of students to accept new methods.
Do you plan to use similar methods in other learning? Why?	Yes, because this method has been proven to improve student understanding. The use of analogies based on local culture will be developed for other subjects so that learning becomes more contextual and meaningful for students.

The results of an interview with a teacher who teaches Computer Engineering and Networking at a Bali Vocational High School showed that before using the subak analogy video, the teaching methods used

were more in the form of lectures, discussions, and laboratory practice. However, students often had difficulty understanding abstract concepts before they did the practice.

After using the subak analogy video, the teacher saw an increase in student understanding, especially in understanding the structure and function of computer networks. Students became more enthusiastic and more active in discussions, because the concepts taught were more relevant to their lives. The teacher considered that local culture-based analogies were very effective in helping students understand complex material. However, there are several challenges in integrating analogy videos into learning. Teachers must adjust the material to the curriculum and ensure that students truly understand the relationship between analogies and computer network concepts. In addition, limited facilities such as video display devices in the classroom are also obstacles.

This study uses a naturalistic qualitative approach in the classroom to identify the usefulness of subak analogy videos in learning computer network concepts. Observations were conducted during the learning process to see how students interact with the material after watching the video, as well as how they relate computer network concepts to the subak system. In addition, interviews with students were conducted to explore their experiences in understanding the material through this video (Prastyadewia et al., 2020; Gestiada et al., 2025). Through this approach, researchers can obtain authentic data on the effectiveness of videos in improving student understanding and identifying factors that influence the learning process.

The results of the study showed that the use of subak analogy videos significantly helped students in understanding the concept of computer networks. Most students felt that the material became easier to understand because of the relationship with the subak system that they were already familiar with. The analogies used in the video, especially the comparison between water flow in subak and data flow in a computer network, provided a more concrete understanding (Indrianto, 2023). In addition, the results of the interviews showed that students felt more interested and motivated in learning after using this video (Barbot, 2020; Ruiz & Gallagher, 2025). However, some students still had difficulty understanding technical terms, so additional explanations from the teacher were needed to strengthen their understanding.

The short-term impact of this research is an increase in students' understanding of the concept of computer networks and an increase in their interest in learning. Students who previously felt the concept of computer networks was too abstract now find it easier to relate it to everyday life (Wang & Li, 2022). Meanwhile, the long-term impact of this research can include increasing the effectiveness of analogy-based learning methods in schools, which can be applied to various other materials. For teachers, the results of this study provide insight into how the use of local wisdom and multimedia in learning can increase student engagement and understanding more effectively (Quiñonez & Mendoza, 2024).

A number of previous studies have shown that the analogy approach can help students understand abstract concepts in various fields of science (Prasetyadewia et al., 2020; Tovar-Gálvez, 2023). The use of natural resource-based analogies has been shown to improve students' understanding of science and technology concepts (Blöse & Gumbo, 2024; Moldalievá et al., 2025). However, previous studies are still limited in the use of analogies based on local culture. Therefore, this study fills the gap by combining the analogy approach based on local wisdom of subak with video-based learning media to improve students' understanding of computer networks.

The novelty of this study lies in the use of subak, a traditional irrigation system in Bali, as an analogy to explain the concept of computer networks in the form of learning videos. Unlike previous studies that used science or technology-based analogies, this study connects the concept of computer networks with systems that students are familiar with in their daily lives. In addition, the use of video as a learning medium provides a more in-depth visual experience compared to text or image-based analogy approaches (Wong & Oh, 2023; Majeed et al., 2024).

Although this study shows positive results, there are several limitations that need to be considered. One major limitation is that the effectiveness of this video may vary depending on the background of the students and their experience with the subak system. Students who are not familiar with subak may need additional explanations to fully understand the analogy used. In addition, this study is still limited to one school, so generalization of the results to a wider population needs to be done with further research. The

implication of this limitation is the need to develop more interactive and adaptive videos so that they can be adapted to various learning contexts in various regions.

CONCLUSION

The conclusion of this study shows that the use of subak analogy videos effectively helps students understand the concept of computer networks more concretely and interestingly. Through an analogy approach based on local wisdom, students can connect abstract concepts with real experiences, thereby increasing their understanding and motivation to learn. The results of observations and interviews confirmed that most students found it easier to understand the material after using this video, although some still had difficulty understanding technical terms. In the long term, this method can be adapted for learning other abstract concepts, as well as providing insight for teachers in developing learning media based on local culture and technology. As a recommendation, it is suggested that further research develop more interactive videos with gamification elements and expand the scope of research to various schools with different cultural backgrounds to test the effectiveness of this method more broadly.

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