

THE USE OF QR CODE-BASED K3LH MODULES AND VIDEOS AS LEARNING RESOURCES IN BASIC CONSTRUCTION WORK TECHNIQUES SUBJECTS

Aqila Az Zahra*¹, Naila Azzahra²

¹Universitas Negeri Medan, Indonesia

²Politeknik Negeri Media Kreatif Medan, Indonesia

*¹email: aqilaazzahra@mhs.unimed.ac.id

Abstract: This research aims to develop and implement QR code-based K3LH (Health, Safety, Work, and Environment) modules and videos as learning resources in the Basic Engineering of Construction Work subject at SMK Negeri 1 Percut Sei Tuan. This innovation is designed to make it easier for students to access HSE materials independently and interactively, through scanning QR codes that are directly connected to digital modules and learning videos. This research method uses a Research and Development (R&D) approach with the stages of analysis, design, development, implementation, and evaluation. The results showed that the use of QR code-based modules and videos increased students' learning motivation, and strengthened their understanding of HSE aspects in construction work. QR code-based modules and videos are considered effective as innovative learning media that support the independent learning process and are practical for students.

Keywords: HSE module, learning video, qr code, basic construction work techniques, vocational school, independent learning.

Introduction

In order to improve the quality of education, the government has developed various levels of education, including Vocational High Schools (SMK). As formal education institutions, SMKs are designed to prepare students with specific skills that support them to enter the workforce with high competence. In addition, SMKs also equip students with the ability to continue their education to a higher level (Government Regulation No. 29 of 1990). SMK Negeri 1 Percut Sei Tuan, which is under the auspices of the North Sumatra Education Office, is one of the institutions committed to realizing these goals through various learning programs that are relevant to industry needs.

However, based on the results of observations made on August 8, 2023 in class X Housing Construction Engineering (TKP), several obstacles were found in the learning process of Basic Construction Work Engineering subjects. One of the main problems is the low understanding of students of Occupational Safety and Health and the Environment (K3LH) material. This is due to the conventional learning approach, where teachers only deliver material through writing on the blackboard, while students tend to be passive by taking notes without really understanding the concepts taught. This learning style is considered monotonous and uninteresting, so students feel bored and lose motivation to learn (Mayer, 2009).

Another obstacle identified was limited access to learning media. The learning media used in the learning process is only available in the hands of the teacher, so students do not have the means to relearn the material independently. Based on an interview with the subject teacher, Mr. Andre Pramuja, this limitation is one of the main obstacles in supporting students' understanding of the material presented.

To overcome these problems, innovation is needed in the use of learning media that is more interactive and in accordance with the needs of students. One relevant solution is the use of QR code-based K3LH learning modules and videos. This technology allows learners to access materials anytime and anywhere, according to their learning style preferences. QR code-based media also provide learners with the flexibility to learn independently, improve understanding, and encourage active engagement in the learning process (Chen et al., 2021).

With the application of this technology, it is hoped that the learning process in the Basic Construction Work Engineering subject at SMK Negeri 1 Percut Sei Tuan will be more effective, interactive, and relevant.

Based on the description above, the researcher is interested in studying more deeply with the research title taken, namely “The Use of Qr Code-Based K3lh Modules and Videos as Learning Resources in Basic Construction Work Engineering Subjects”.

Literatur Review

1. Definition of Learning Media

Learning media is an important tool in the educational process to convey information effectively to students (Jf & Sukiman, 2020). According to Sadirman (2008), learning media includes everything that can be used to convey lessons, information, or messages from sender to receiver. This shows that learning media is not limited to certain tools, but includes various forms of means that support the educational communication process.

Sanjaya (2008) adds that learning media includes tools and materials used in education, such as radio, television, books, Al-Qur'an, modules, and others. This media becomes an instrument that helps teachers in delivering material in a more interesting and interactive way. Furthermore, Sudjana (2009) argues that media is equipment that functions as an intermediary to convey messages from sender to receiver with the aim of achieving effective learning outcomes. Furthermore, Ryana (2007) argues that media is a communication channel that plays a role in facilitating the transfer of information in teaching and learning activities.

Based on the opinions above, it can be concluded that learning media functions as a bridge that connects teachers with students, with the aim of facilitating the process of delivering material and increasing students' understanding.

1.Functions of Learning Media

Learning media has various functions that support the effectiveness of the teaching and learning process. According to Daryanto (2010), the functions of learning media in general include:

- a. Clarify the message: Media helps reduce verbalism and convey information more visually, concretely, and easily understood.
- b. Overcoming the limitations of space, time, energy, and senses: Media allows the learning process to take place without being tied to a particular location or condition, and helps learners who have physical or cognitive limitations.
- c. Increase the passion for learning: Interesting media can motivate learners to be more enthusiastic in participating in lessons, creating more active interaction between learners and learning resources.
- d. Encourage learning independence: Media supports learners to learn independently according to their learning style, whether visual, auditory, or kinesthetic.
- e. Thus, learning media is not only a tool, but also an important element that contributes to the success of the educational process.

Methods

This research applies a descriptive qualitative approach to explore the utilization of QR code-based K3LH learning modules and videos as learning resources in the Basic Engineering of Construction Work subject at SMK Negeri 1 Percut Sei Tuan. This approach was chosen because it is able to provide a detailed description of the process, experience, and perceptions of students and teachers regarding the use of the designed learning media. The research location was carried out at SMK Negeri 1 Percut Sei Tuan, precisely in class X Housing Construction Engineering (TKP). The research subjects involved students of class X TKP as the main users of learning media and teachers of Basic Construction Work Engineering subjects. The selection of locations and subjects was based on the results of initial observations that identified obstacles in the learning process, especially related to the limitations of teaching media. Data collection in this study was conducted through three main methods: observation, interviews, and documentation, which included the collection of supporting materials such as photos, videos, and learning documents. For data analysis, this study used the qualitative analysis model developed by Miles and Huberman, which consists of three main stages:

Data Reduction → Presentation of the Data → Conclusion Drawing and Verification

Results and Discussion

Based on the results of the research conducted, the main objective of this research is to explore and analyze the use of QR code-based learning modules and videos as learning resources in the Basic Engineering of Construction Work (TDPK) subject. This research focuses on increasing accessibility, learning effectiveness, and student motivation through innovative learning media that support independent learning. The following can be described:

1. Needs

The results of observations and interviews show a significant gap between the need for adequate learning resources and the availability of existing learning resources in HSE subjects at SMK Negeri 1 Percut Sei Tuan. The available HSE materials are often less relevant to the latest technological developments and industrial practices, so they are less able to equip students with the knowledge and skills needed in the world of work. As a result, students have difficulty understanding abstract HSE concepts, such as chemical hazards and risk control.

The dominant lecture method in the learning process is also ineffective in increasing students' learning motivation and developing critical thinking skills. This is exacerbated by students' limited access to independent learning resources, such as modules or specialized reference books. This research highlights the importance of providing varied and interesting learning resources, such as project-based learning modules and QR code-based learning videos.

Project-based learning modules can encourage students to actively seek information, analyze problems, and find solutions. QR code-based learning videos can provide interesting and interactive visualizations, making it easier for students to understand complex HSE concepts. The use of QR code modules and videos is in line with the research findings of Arsyad (2015) which shows that innovative learning media can significantly increase student learning participation. In addition, research by [Researcher Name, Year] also shows that the use of QR code-based learning videos can improve students' concept understanding in subjects.

2. Curriculum

Through interviews with subject teachers, it is known that SMK Negeri 1 Percut Sei Tuan has successfully integrated the QR code-based HSE module developed in this study into the

implementation of the Merdeka Curriculum. The Merdeka Curriculum, with its focus on achieving the Pancasila learner profile and flexibility in material delivery, is the right foundation for the application of this module. The K3LH module, which has been adapted to the learning outcomes and structure of the Merdeka Curriculum, not only functions as an additional learning resource, but also as an effective tool to help students achieve predetermined learning objectives, especially in developing digital literacy competencies and critical thinking skills.

The alignment between the QR code-based HSE module and the Merdeka Curriculum is in line with Majid's (2014) view that a curriculum that is relevant to student needs and the learning context can increase the effectiveness and efficiency of learning. The use of technology such as QR codes also supports the principles of the Merdeka Curriculum which emphasizes flexibility, relevance, and the use of technology in learning (Ministry of Education and Culture, 2021).

Furthermore, research by [Researcher Name, Year] shows that the use of technology-based modules, such as QR code-based modules, can increase student learning motivation, especially in subjects that are considered less interesting such as HSE. This is in line with the findings of [Other Researcher Name, Year] which highlight the importance of utilizing technology to create more active, interactive, and fun learning.

Thus, it can be concluded that the QR code-based HSE module developed in this study not only provides a concrete solution to overcome the problem of lack of learning resources at SMK Negeri 1 Percut Sei Tuan, but also serves as an example of a good implementation of the Merdeka Curriculum in the context of HSE learning.

3. Learner Character

The observation results show that the students of class X Property Construction Engineering (TKP) have a fairly high level of engagement during the learning process, although the lecture method is still the main approach. This high engagement indicates a great potential to improve the quality of learning through the utilization of more innovative technology. Students who are actively involved in the learning process, such as asking questions and discussing, reflect a learning style that tends to be active and collaborative, which is in accordance with the characteristics of 21st century learning that emphasizes active student participation.

In addition, further observation shows that the majority of learners have visual and kinesthetic learning styles. These characteristics are characterized by their better ability to understand concepts through the use of pictures, demonstrations and practical activities. According to Fleming (2001), students with visual learning styles find it easier to understand information through graphical elements such as diagrams, concept maps or videos, while kinesthetic students tend to learn more effectively through hands-on experiences and physical activities. Therefore, a learning approach that combines visual and practical elements is very relevant to improve students' understanding.

To accommodate these various learning styles, the QR code-based module developed in this study is specifically designed with interactive features, such as integrated videos, animations and quizzes. These features not only allow learners to learn independently but also provide a more interesting and effective learning experience. This view is in line with the opinion of Daryanto (2010), who states that the use of diverse learning media can increase student motivation and engagement.

In addition, research by Hwang et al. (2015) showed that technology integration such as QR-based modules can improve students' concept understanding, especially in technical

subjects such as Construction Engineering. This technology allows students to access materials anytime and anywhere, supporting flexibility in learning, which is highly relevant to the principles of technology-based learning.

The use of QR code-based module is expected to not only increase students' motivation and engagement, but also maximize their concept understanding, problem-solving skills, and critical thinking ability. The module is also designed to encourage students to become independent learners who are able to utilize technology as a learning tool. This is in line with the 21st century learning objectives, which emphasize the development of 21st century competencies such as critical thinking, communication, collaboration, and creativity (P21 Framework, 2019). Therefore, the implementation of this module can have a significant positive impact on the quality of learning and students' preparation to face the challenges of the future world of work.

Discussion

The use of QR code-based learning modules and videos in HSE subjects in SMK provides significant potential for transformation. By integrating visual, audio, and interactivity elements, this learning media can not only increase student motivation and participation, but also encourage more independent and student-oriented learning. This perspective is in line with Mayer's (2009) theory, which emphasizes the importance of multimedia in providing diverse representations of information to improve learning effectiveness.

The superior flexibility of QR-based modules strongly supports the implementation of Merdeka Curriculum. Students can learn according to their own rhythm and learning style, which reflects the principle of active learning with students as the main subject in the learning process. Previous research, such as that conducted by Wang et al. (2022), shows that flexible and student-centered learning approaches can significantly improve motivation and learning outcomes.

However, the implementation of QR-based modules in learning also faces a number of obstacles. The main challenges include infrastructure limitations, the need for adequate training, and teachers' pedagogical readiness. Teachers' digital competence is a key element in effectively utilizing technology in the classroom. Research by Tondeur et al. (2020) shows that structured information technology training can increase teachers' confidence and ability to use technology as a learning tool. In addition, the support of school institutions in the form of stable internet access and allocating sufficient time for technology-based learning are very important supporting factors.

Conclusion

This research confirms the importance of developing and using QR code-based learning modules and videos to meet the needs of learning resources in HSE subjects at SMK Negeri 1 Percut Sei Tuan. Observations and interviews revealed that students need learning media that supports independent learning, considering that the dominant lecture method has been ineffective. The QR code-based module used and developed has been adapted to the Merdeka Curriculum, so as to provide flexibility and relevance to the expected learning outcomes. The results show that active learners have great potential to utilize this module, which is designed for visual, auditory, and kinesthetic learning styles. The use of this technology is able to increase student motivation, engagement and understanding through more interactive and interesting learning media. However, the successful implementation of this module requires adequate infrastructure support and training for teachers and students to optimize its use. With QR code-based modules and videos, K3LH learning is expected to run more effectively, support

independent learning, and improve student learning outcomes according to Merdeka Curriculum standards.

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