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Development of a digital module for planning and installation of the audio system subject in audio-video engineering skills competency

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ABSTRACT

The development of digital module in Planning and Installation of Audio Systems Subject for grade XI at SMKN 10 Makassar aims: (1) to discover the description of the needs for digital module for planning and installation audio system subject at SMKN Negeri Makassar, (2) to design the product of digital module in planning and installation of audio system at SMKN 10 Makassar, and (3) to measure the level of validity, practicality, and effectiveness of digital module for planning and installation of audio system at SMKN 10 Makassar. This study is a Research and Development (R and D) type of research, using the development model ADDIE model, which consists of five stages, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. The number of test subjects was two validators, subject teachers, and class IX students at SMK Negeri 10 Makassar. This research shows that the students' needs are met with the required qualifications. Digital modules are developed according to the needs of students and teachers using Canva and Microsoft. The results of expert validation, teacher responses, limited trials, and small group trials, as well as evaluation of student learning outcomes, are in the outstanding category, indicating that the digital module for planning and installing audio systems is declared valid and practical (easy to use) and effectively used in the learning process.

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ABSTRAK

Pengembangan modul digital pada Mata Pelajaran Perencanaan dan Instalasi Sistem Audio untuk kelas XI di SMK Negeri 10 Makassar bertujuan yaitu untuk: (1) mengetahui gambaran kebutuhan modul digital perencanaan dan instalasi sistem audio di SMK Negeri 10 Makassar, (2) mendesain produk modul digital perencanaan dan instalasi sistem audio di SMK Negeri 10 Makassar, (3) mengukur tingkat validitas, kepraktisan, dan efektifitas modul digital perencanaan dan instalasi sistem audio di SMK Negeri 10 Makassar. Penelitian ini merupakan penelitian jenis Research and Development (R and D) menggunakan model ADDIE terdiri dari lima tahapan yaitu: (1) analysis, (2) design, (3) development, (4) implementation, (5) evaluation. Jumlah subjek uji coba yaitu 2 validator, guru mata pelajaran, dan peserta didik kelas IX SMK Negeri 10 Makassar. Hasil penelitian ini menunjukkan tingkat kebutuhan peserta didik berada pada kualifikasi dibutuhkan. Modul digital dikembangkan sesuai kebutuhan peserta didik dan guru dengan menggunakan canva dan Microsoft. Hasil validasi ahli, tanggapan guru, uji coba terbatas, dan uji coba kelompok kecil, serta evaluasi hasil belajar peserta didik berada pada kategori sangat baik sehingga menunjukkan bahwa modul digital perencanaan dan instalasi sistem audio dinyatakan valid dan praktis (mudah digunakan) dan efektif digunakan dalam proses pembelajaran.

Kata Kunci: *kreativitas dalam pembelajaran; modul digital; perencanaan dan instalasi sistem audio*

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INTRODUCTION

The rapid development of technology presents numerous opportunities and challenges for improving the quality of education in Indonesia, particularly since not everyone can effectively utilize technological tools. A significant external challenge in this regard is information and Communication Technology (ICT) (Sari *et al*., 2019). ICT fulfills three key roles in education. First, it acts as an educational medium, bridging the gap to convey messages and present instructional content during classroom activities. Second, ICT is a significant source of information. Finally, it functions as a learning system that enhances the continuity and efficiency of the educational process.

Using technology as both a learning tool and resource in education can significantly enhance the delivery of instructional content and improve the overall learning process in schools. When developing curricula for primary and secondary education, it is essential to incorporate a scientific approach, effective learning strategies, appropriate assessment methods, and authentic learning experiences. Several essential skills need to be developed, which include life and career skills, learning and innovation skills, and information and media technology skills. In online learning environments, teachers should recognize emerging issues, devise effective strategies, analyze students' learning styles or modalities, and choose the suitable type of online learning (Kusyanti, 2021). Therefore, it is crucial for teachers to continuously develop their competencies through professional self-development in order to enhance educational quality. This includes improving their instructional practices and deepening their understanding of advancements in science and technology (IPTEK).

This is reinforced UU RI No. 11 Tahun 2019 tentang Sistem Nasional Ilmu Pengetahuan dan Teknologi, particularly Article 3, which stipulates that science and technology can: a) Promote and enhance the quality of education, research, development, and the application of science and technology to generate discoveries and innovations; b) Increase the intensity and quality of interaction, collaboration, and synergy among stakeholders in science and technology; c) Enhance the utilization of science and technology for sustainable national development, improved quality of life, and public welfare; and d) Strengthen national independence, competitiveness, and attractiveness to advance national civilization.

Teachers, serving as learning facilitators, are expected to effectively use technology to improve the quality and efficiency of the learning experience. Preliminary observations at SMK Negeri 10 Makassar in the Audio System Planning and Installation subject of the Audio Video Engineering program indicated that students should cultivate skills and creativity critical to their vocational competencies. Learning materials for students and teachers have been tailored to fulfill instructional requirements, with supplementary resources such as access to the school library, projectors, and Wi-Fi already provided. The school also offers practical learning environments that come equipped with essential facilities. However, interviews with subject teachers reveal that ICT integration remains underutilized due to time constraints. Teachers pointed out several challenges during the restricted face-to-face instruction, including issues with effectively conveying content and the lack of comprehensive subject matter in the vocational textbooks. These findings show that while resources are adequately available, a potential solution lies in developing a digital module using Canva to assist teachers and students in learning. Canva, an online design tool, provides a range of templates to assist teachers in creating engaging and innovative educational content. Its capabilities for multimedia integration, including images and videos, enhance the interactivity and attractiveness of digital modules. Additionally, Canva's collaborative features allow teachers and students to co-create materials, promoting a more inclusive and participatory learning environment.

The Canva application helps students grasp lessons better by displaying text, videos, animations, audio, images, and graphics in an engaging, customizable layout. This appealing presentation maintains student focus. Canva, a graphic design platform, enables users to create online content. A key application is the

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development of digital learning modules with interactive features, such as embedded images and video links, to boost engagement (Randa & Taali, 2020). Canva is available in multiple formats—web-based, iPhone, and Android—ensuring that digital modules are accessible across devices, thereby supporting flexibility in both synchronous and asynchronous learning environments.

Implementing the learning process, supported by appropriate learning resources such as digital modules, can significantly enhance students' understanding of meaningful knowledge through the direct experiences they gain. In this context, direct experience refers to the interaction between students and the learning materials. Students need files containing text and images, and books that can provide direct experience in the form of videos containing simulations of events related to the material being taught (Nurhikmah *et al*., 2021). This suggests that students benefit more from learning materials that provide immersive and realistic content representations. Therefore, the concept of digital modules that integrate various interactive media components can facilitate the effective, efficient, and engaging presentation of material, enabling students to achieve the intended learning outcomes more successfully.

Several previous studies serve as valuable references, including developing a web-based interactive digital module on virtual private network (VPN) hardware, which was a practical approach in supporting the learning process. Implementing this module has been empirically proven to improve the quality of learning by strengthening student engagement and enhancing their understanding of the subject matter. Furthermore, in this context, the Bord and Gall framework has also demonstrated its effectiveness in designing learning modules that align with students' needs and instructional goals. This approach significantly contributes to innovations in teaching methods and improves overall learning effectiveness (Majid *et al*., 2020). Moreover, the COVID-19 pandemic did not hinder the application of innovative learning strategies. Problem-based learning (PBL) e-modules effectively enhanced students' critical thinking skills in Indonesia during the pandemic. The findings indicate that most students demonstrated a high level of critical thinking ability after utilizing the e-module, confirming that this instructional approach has a positive and measurable impact on fostering students' critical thinking skills (Mahmudah *et al*., 2022). The results from implementing digital modules also significantly boost students' ability to think critically, or more broadly, to develop higher-order thinking skills. Additionally, developing digital modules by incorporating a collaborative learning approach during the content creation process has offered a practical solution to overcoming common challenges and barriers in the learning process (Fitriyah & Ramadani, 2021).

This study aims to determine the extent to which students' needs for digital modules, specifically designed for the Audio System Planning and Installation subject, are met. Based on the results of the needs analysis, the research proceeded with the design and development of digital modules that are valid, practical, and effective, in alignment with the identified level of need within the Audio System Planning and Installation subject at SMK Negeri 10 Makassar. The designed digital module is intended to support both teacher and student facilities during the learning process and is accessible at any time and from anywhere. It is expected to be an alternative instructional tool for creating interactive, engaging, and compelling learning experiences. Furthermore, the digital module aims to reduce boredom, enhance learning motivation, and positively influence students by providing meaningful learning experiences. Ultimately, it is anticipated that using this digital module will contribute to achieving optimal learning outcomes among students at SMK Negeri 10 Makassar.

LITERATURE REVIEW

Educational Technology Area

The Association of Educational and Communication Technology (AECT) defines educational technology as a complex and integrated process that involves people, procedures, ideas, devices, and organizations. In this context, educational technology refers to a unified and systematic process incorporating human

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resources, methods, concepts, tools, and institutions to analyze problems, utilize resources, conduct assessments, and manage learning processes effectively (Yaumi, 2016). Educational technology is conceptualized based on five core areas of practice, commonly called the five domains of educational technology. These include the design domain, which focuses on the planning and development of learning strategies and educational products; the development domain, which involves the production or realization of the designs into tangible materials or tools; the utilization domain, which pertains to the practical application and implementation of models, instructional media, or outputs from the development domain; the management domain, which relates to the control and coordination of educational technology operations; and the evaluation domain, which is concerned with determining the effectiveness or adequacy of the learning interventions implemented. These five components are interconnected and function cohesively, as they complement, support, and synergize with one another to improve the overall quality of education.

One of the key areas in educational technology is the development domain, which refers to translating design specifications into tangible or physical forms. This includes using print, computer, and integrated or blended technologies. These are audiovisual, print, multimedia, and computer-based technologies (Lailan, 2020; Yaumi, 2016). Within this development domain, a wide range of technologies is utilized to support the effective delivery of instructional messages, making the learning process more progressive and dynamic. For instance, learning materials can be developed using a specific type of technology. At the same time, the production of instructional tools may involve different technologies, and presentation activities can incorporate yet another set of technologies. This flexibility in using various technological tools ensures that learning becomes more adaptive, engaging, and aligned with the evolving needs of learners (Nurkamilah *et al*., 2020)

Digital Education and Learning Technology

Educational technology and digital learning are interrelated concepts. Educational technology refers to the application of technology in developing digital learning, whereas digital-based learning involves practitioners who effectively utilize technology to enhance students' learning experiences. Digital technology in education can be understood as a digital processing system that promotes active learning, knowledge construction, and self-exploration, while enabling remote communication between teachers and students in different locations. This represents the use of technology that assists in delivering a broader learning message across diverse classrooms, entire schools, and other learning centers (Hidayat & Khotimah, 2019). Educational technology in digital learning plays a crucial role in enhancing the overall quality and effectiveness of the learning process. It provides a wide range of tools and platforms that enrich the learning experience and enable learners to access diverse perspectives and gain broader, more in-depth knowledge. By integrating digital technologies, students access various digital learning resources, including e-books, academic journals, instructional videos, interactive simulations, and online courses. These resources support individualized learning, promote autonomy, and help bridge geographical and temporal barriers, ultimately contributing to more flexible, inclusive, and engaging educational experiences.

Learning Materials

Teaching materials encompass written and unwritten forms used to assist teachers in conveying learning messages during teaching and learning activities (Devi *et al*., 2018). In their journal, teaching materials are also defined by (Putra & Nurafni, 2021) as instructional content systematically, sequentially, and comprehensively designed by educators, referring to basic learning competencies. This structured development enables students to study independently, making learning more efficient, interactive, and

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effective. Therefore, teaching materials are recognized as essential learning resources that contain subject matter capable of optimizing the teacher's role in delivering instruction.

The primary purpose of the teaching material is to enhance students' competence in various fields, including the planning and installation of audio systems. Several general objectives of the teaching material support students' competence in this area (Sulastri, 2024).

1. Improving Technical Competency
   Teaching materials designed for audio system planning and installation typically aim to enhance learners' ability to comprehend and apply technical concepts related to audio systems. This includes understanding how audio systems work, selecting the right devices, and installing them correctly.

2. Improving Creative Competency
   This teaching material can also help learners develop creativity in designing and implementing audio systems that meet specific needs. This includes considering factors such as space, reference, and culture.

3. Improving Interactive Competency
   Interactive teaching materials, such as digital ones, can help learners understand and apply concepts more effectively. This interactivity can increase learner engagement and facilitate their learning process.

4. Improving Critical and Analytical Thinking Competency
   This teaching material can also help learners develop critical and analytical thinking skills. This includes understanding how audio systems work, considering the factors that affect them, and making informed decisions about the planning and installation of audio systems.

5. Improving Competence in Cooperation and Collaboration
   These open materials can help learners develop their cooperation and collaboration skills. This includes working in teams to design and install complex audio systems.

6. Improving Adaptation and Innovation Competency
   These open materials can also help learners develop their adaptation and innovation skills. This includes considering various situations and making necessary adjustments to the planning and installation of audio systems to ensure optimal performance.

By using appropriate and effective teaching materials, learners can enhance their competence in audio system planning and installation and develop other skills necessary in technology and engineering.

Digital Module

Digital modules are categorized as one type of digital learning material. Modules are frequently used in face-to-face and distance learning, enabling learners to study independently without needing an educator. The advantages of digital modules as learning materials for learners to use during independent study in face-to-face instruction are limited, whereas learners have many objectives they wish to achieve (Munandar *et al*., 2021). Therefore, the module used needs to contain material presented systematically, using language that is easy to understand, and integrated with engaging and interactive media, so that the digital module can represent the teacher. For this reason, the module is also referred to as independent instructional material. Using digital modules as a source and teaching material for students in independent

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learning is essential because it enables students to acquire learning materials independently, according to each student's ability to observe and solve the problems presented in the module (Alperi, 2019). In this case, digital modules become one of the digital teaching materials that can support a more effective learning process, as they can include various types of content, such as videos, audio, animations, and interactive images. This makes the subject matter more engaging and easier for learners to understand than traditional texts. Digital modules can also be equipped with interactive features, such as quizzes, educational games, simulations, and project-based tasks, which learners can access and complete directly. This enables them to be more actively involved in learning and access it anytime, anywhere, through devices such as computers, tablets, or smartphones. This will enable learners to study at their own pace and at times convenient for them, enriching their learning experience.

Characteristics of the Digital Module

Digital modules enable students to receive education more easily, as the modules developed based on specific characteristics can be more complex and interactive. This enables students to access materials anytime and anywhere, allowing them to study according to their learning capabilities. Some characteristics of digital modules include: 1) Self-instructional, in this context, means it can be used for independent learning. The use of the module provides opportunities for learners to practice their independent learning skills, allowing them to test themselves through the exercises presented; 2) Self-contained in this context means that the coverage of the material can be presented in its entirety to achieve specific competencies; 3) Stand alone, which means that in the use of digital modules, it does not rely on other applications, adaptive which means it should adjust to the developments in knowledge and technology; 4) "User friendly," or easy to use (Lestari *et al*., 2022). The learning materials in the module are designed to facilitate students' ease of use, including simplicity in responding and learning according to their preferences, using clear and straightforward language that is easy to understand, and utilizing commonly used terminology.

Functions and Objectives of Writing a Digital Module

Using digital modules to deliver learning materials aims to enhance learning effectiveness. Digital modules allow learners to study independently and follow the learning process at their own pace. Digital modules are independent learning tools incorporating planned learning experiences to help learners achieve their educational goals (Ernawati & Susanti, 2021). The digital module enhances efficiency and effectiveness in delivering learning materials while implementing limited face-to-face classes. It can also serve as study material for both group and individual learning, allowing students to study the digital modules at their own pace and according to their learning characteristics. Therefore, in the preparation of the digital module, the aim is to provide materials that meet the demands of the curriculum while considering the needs of the students, aligned with the characteristics of the subject matter and the characteristics of the students, as well as the rules or background of their social environment (Dewanty & Farisya, 2023).

Using digital modules in learning activities aims to enhance the effectiveness of education. The development of a digital module includes several objectives: 1) The module can clarify the delivery of messages and make them easier to understand; 2) The module can provide a solution to the limitations of sensory capacity, time, and space for both learners and educators; 3) The module can serve as a resource to enhance learners' motivation. Digital modules are designed as learning materials for online education (Primadi *et al*., 2018). The functions of using digital modules are: 1) Addressing the weaknesses of conventional learning; 2) Increasing students' motivation to learn; 3) Enhancing educators' creativity in creating efficient and effective individualized learning; 4) Realizing the principle of sustainable progress; 5) Improving learning concentration (Puspitasari, 2019).

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Canva-Based Digital Module

Digital modules must have components and designs that capture students' interest in reading them. One platform that supports the development of digital modules is Canva. Canva is a digital platform in graphic design, requiring an account that connects users, allowing them to design various types of creative content online easily and starting from designing greeting cards, posters, brochures, infographics to presentations by offering multiple features such as different designs, free fonts, links, barcodes, and more, with image upload features, video, audio, various features such as transitions, built-in animation, hyperlinks and others, making it easier to develop interactive digital modules. The Canva platform can be used in multiple versions, such as web, iPhone, and Android (Hudayanti, 2022).

Canva offers a range of templates and features that can help teachers create digital teaching materials and implement technology-based learning, enhancing skills, creativity, and other benefits. Some Canva features that can help create engaging and interactive digital modules are: 1) Canva provides thousands of customizable templates for different types of content, 2) Canva's collaboration feature allows multiple users to work on the same project in real-time, 3) Canva has an extensive library that includes millions of graphics, images, videos, icons, illustrations, animations, and text editing options that can be used to enhance digital module content, 4) Canva allows users to download designs in various formats, including PDF, PNG, JPG, and MP4, and 5) Canva can be integrated with various other platforms, such as Google Drive and Dropbox, to facilitate file storage and sharing.

METHODS

This research represents a kind of research and development. The research design adopted by the researchers is the ADDIE model proposed by Dick and Carey (Musaddat *et al*., 2021) consists of five phases or stages, namely Analysis, Design, Development, Implementation, and Evaluation. The researcher chose this research model because it has stages that are easy to understand, and this model aligns with the researcher's goal of producing a Digital Module. The five stages in the ADDIE development model are undertaken systematically. The framework used is structured for instructional development and is accompanied by evaluation and revision at each stage. In addition, the ADDIE development model previously focused on education and learning, designed to produce learning software (Alivia & Nursalman, 2023).

This research is located at SMK Negeri 10 in Makassar City, South Sulawesi Province. The subjects of this study consist of one material expert, one media expert, one vocational school teacher, and 20 students. The selection of research subjects, in this case, students, was conducted using purposive sampling technique, meaning that the subjects were chosen based on the consideration that these students are from SMK Negeri 10 in Makassar City and are taking the Audio Visual Expertise because the developed digital module is related to learning about Audio System Installation.

The data collection techniques consist of field observations, directly observing the research location to identify needs. These needs are then analyzed as a foundation for developing a digital module. During the data collection process, questionnaires were also utilised, including content/material validation questionnaires, media validation questionnaires, teacher response questionnaires, and student response questionnaires. To obtain more in-depth research results, interviews were also conducted with teachers and students regarding their previous learning process and the use of digital modules in this context. The data analysis techniques used are qualitative descriptive techniques that process data from the responses of media or instructional design experts, and subject matter experts by grouping all information from qualitative data in the form of feedback, responses, critiques, and suggestions for improvement found in

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the questionnaires and interview results; and descriptive static analysis that processes the data obtained through the questionnaires in descriptive percentage form.

The formula used to calculate the percentage of the results from the identification of needs, validity, and practicality is

$$percentage = \frac{\sum (Response\ x\ weight\ for\ every\ choice)}{N\ x\ highest\ score}\ x\ 100\%$$

The following is the formula to compute the total percentage of the subject:

Percentage = F: N

Description:
F = overall percentage of the subject
N = many subjects

The following stipulations determine the percentage results and decision-making.

Table 1. Conversion of Validity Achievement Levels with a 5-Point Scale

Achievement Levels	Qualifications	Descriptions
90% - 100%	Very Good	No need to revise
75% - 89%	Good	No need to revise
65% - 74%	Quite good	Revised
55% - 64%	Not Good	Revised
0% - 54%	Not Good At All	Revised

Source: Tegeh et al. in the book "Model Penelitian Pengembangan" 2014

Based on **Table 1**, if the test validity results are between 75% and 100%, in this case, they qualify as good to very good, and thus are declared valid and do not require revision. Conversely, if the test validity results fall between 65% and 0%, or if they qualify as sufficient, poor, or very poor, then the product requires revision.

Table 2. Conversion of Practical Achievement Level to a 5-Point Scale

Achievement Levels	Qualifications	Descriptions
90% - 100%	Very Good	No Need to Revise
75% - 89%	Good	No Need to Revise
65% - 74%	Quite Good	Revised
55% - 64%	Not Good	Revised
0% - 54%	Not Good At All	Revised

Source: Tegeh et al. in the book "Model Penelitian Pengembangan" 2014

Based on **Table 2**, if the practicality test results fall within the 75% to 100% range, the outcome is considered good to very good and deemed practical, thus not requiring revision. Conversely, if the results

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of the practicality test are in the range of 65%—0% or qualify as inadequate, insufficient, or very insufficient, then the product is deemed not practical and requires revision.

The effectiveness can be calculated by determining the normalized Gain score. The effectiveness formula is based on the formula used by Triyono et al. (2024).

$$N - Gain = \frac{Postest\ Score - Pretest\ Score}{Max\ Score - Pretest\ Score}\ x\ 100\%$$

Descriptions:
N-Gain = Gain Term Nominal
Pretest = Initial Learning Value
Posttest = Final Learning Value

The category of interpretation of effectiveness from Gain is in **Table 3** (Arini *et al*., 2016).

Table 3. Conversion of Effectiveness Achievement Level from Gain

Achievement Levels	Qualifications
<76%	Effective
56% - 75%	Quite Effective
40% - 55%	Not Effective Enough
>40%	Ineffective

Source: Ariani et al. (2016)

RESULTS AND DISCUSSION

The research and development of the Digital Module for Audio System Planning and Installation, utilising the ADDIE development model, commenced with the analysis phase. In this phase, the researcher identified the issues at SMK Negeri 10 Makassar by analyzing the characteristics of the students and identifying the needs for developing teaching materials. After completing the analysis phase, the researcher designed the digital module based on the previously collected data, selecting several applications used in the process, namely Canva and Microsoft Word. The developed digital module contains text, images, videos, exercises, summaries, and a glossary. The table of contents has been set up as hyperlinks to the corresponding sections within the digital module.

The results obtained from the needs identification stage to the evaluation stage are presented below.

Student Characteristics Analysis

The students of SMK 10 Makassar in the 11th grade, specializing in Audio-Visual skills, are typically between the ages of 16 and 17. Students are transitioning into adulthood at this age, which drives them to try new things, including in their learning, continually. Students at this level are closely connected to technology, and their ability to operate computers and gadgets is already quite good.

Identification of Student Needs

The stage of identifying needs assesses the learning process's condition and the learners' appropriate learning media. To determine the media required by the learners, questionnaires are distributed to identify the needs of the students, specifically those in the XI grade of the Audio Video vocational program. This

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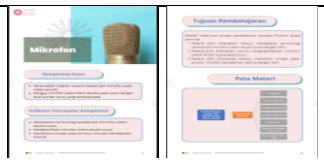
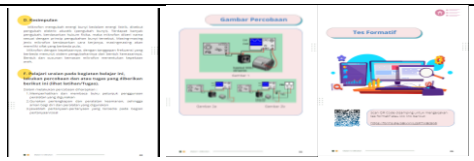
questionnaire was completed by 20 students from the Audiovisual Engineering program at SMK Negeri 10 Makassar. The results indicate that students require digital modules that can be used independently, containing not only text and images but also instructional videos to assist them in understanding the lesson material. These findings provide a basis for researchers to design a digital module for planning and installing audio systems.

Digital Module Design

The digital module for planning and installing audio systems was created based on a previously designed prototype. It was formatted using Canva as a digital module for the SMK Negeri 10 Makassar XI AV class. The digital module includes text, images, videos, exercises, summaries, and a glossary. While creating the digital module, the researcher determined the positions of the videos and tasks to provide sufficient space. Table 4 shows the results of the digital module development.

Table 4. Display of the Digital Module for Audio System Planning and Installation

Scane	Image	Description
1		Digital module home screen cover
2		Introduction page
3		Table of contents
4		The first page of the material contains the Learning Outcomes, Achievement Indicators, Learning Objectives, and a Material Map, followed by the lesson material.
5		Digital module containing images and videos
6		The pages at the end of each chapter contain summaries, practice exercises, and formative tests.

Source: Research Document, 2023

Validity, Practicality, and Effectiveness of Digital Modules

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Product Validation

After developing the digital module, media experts and content specialists evaluated the learning material produced by the researchers to ensure its validity for use in the research process, specifically the implementation of the digital module in the learning process for Audio System Planning and Installation.

1. Expert Validation of Content/Material

Table 5. Validation Results by Subject Matter Expert

No	Assessment Aspects	Scale
1	The accuracy of the title in each chapter corresponds to the content of the material	4
2	Clear presentation of guidelines in every chapter	5
3	Clarity of the material map with the material that is described	5
4	Clarity of material description	5
5	Operational Learning Objectives	4
6	Alignment of Learning Objectives with Material Presentation	5
7	Clarity in the presentation of examples	5
8	Language Appropriateness	4
9	The alignment of the image/illustration with the subject matter	5
10	Completeness of the component materials in the digital module	5
11	Understanding of the tasks and assignments provided	5
12	Consistency among assignments, practices, and content	4
13	Accuracy of summary content selection	5
14	The alignment of the final test of each chapter with the learning objectives	5
15	The accuracy of the supporting sources used as references in finding relevant reading materials for the subject	5
	Total	**71**

Source: Research document, 2023

$$percentage = \frac{71}{15\ x\ 5}\ x\ 100\% = 94\%$$

The results of the expert validation of the content/material obtained a percentage of 94%, placing it in the very valid category. Table 5 indicates that the material in the digital module is suitable for use. The feedback provided by the expert validators suggests that the material included is of very high quality; however, some typographical errors still require correction.

2. Media Expert Validation

Table 6. Validation Results by Content Material Expert

No	Assessment Aspects	Scale
1	The appeal of the cover design	5
2	Typing layout accuracy	4
3	The consistency of space usage in titles, subtitles, and the typing of material	5
4	Writing/typing comprehensibility	5
5	The appropriateness of the text size on the digital module	5
6	Color proportions used in the digital module	4
7	The completeness of components in each chapter of the digital module	5
8	Clarity of illustrations and image descriptions in the digital module	5
9	Precision in the way material is presented	5
10	Video clarity within digital modules	5
	Total	48

Source: Research document, 2023

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$$percentage = \frac{48}{5\ x\ 10}\ x\ 100\% = 96\%$$

Based on the validation results by media experts in **Table 6**, achieving a percentage of 96% places it in the highly valid category after several media revisions based on expert recommendations. These results indicate that the media and design of the digital module for audio system planning and installation have met the requirements to progress to the next stage.

3. Teacher's Response

The response/assessment conducted by the teacher regarding the digital module for planning and installing audio systems for the XI AV class at SMK Negeri 10 Makassar includes several aspects, namely the quality of presentation, ease of use, and clarity of material presentation, which are rated as very good, as well as the suitability with the characteristics of the students and ease of the learning process, which are rated as good in its implementation. The results of the teacher's response/assessment of the digital module for planning and installing audio systems indicate a percentage of 92.5% for practical qualification, which does not require revision.

4. Limited Trial

A limited trial involved three XI AV class students with high, medium, and low abilities. The selection was made based on the evaluation results obtained from the subject teacher. Before the trial, the researcher explained how to use the digital module for audio system planning and installation. Subsequently, students were allowed to use the digital module independently. After the students finished using the digital module, the researcher provided a questionnaire for their feedback on the digital module. The students also offered responses through the distributed questionnaire. Below are the assessment results from the students during the limited trial.

Table 7. Results of Student Responses/Evaluations

No	Assessment Aspects	Respondents			Score Total	%
		A	B	C		
1	The quality of the display (proportional between color, text, and images)	5	4	5	14	93,33
2	The size and font type used are easy to read.	5	5	5	15	100
3	Clarity of the title and subchapters of the digital module on planning and installation of audio-visual systems	4	5	5	14	93,33
4	Using media that is easy to comprehend	5	4	5	14	93,33
5	Explicit content with educational objectives	5	5	5	15	100
6	The size and font style used are easy to read	5	5	5	15	100
7	Alignment of the image with the text	5	5	5	15	100
8	The convenience of accessing the menu/tools in the digital module	4	5	4	13	86,67
Score Total		38	38	39	14,37	95,83
Percentage (%)		95	95	97,5		

Source: Research Document, 2023

Results from the limited trial in **Table 7** show an average score of 14.37, with 95.83% falling into the convenient category and requiring no revisions. This indicates that the students positively received the digital module. The students could use the digital module effectively independently, making it a suitable learning tool. The students' comments after using the digital module are as follows: 1) It is very easy

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for me to understand, and the images are obvious, 2) The media module is perfect, the material and explanations are also easy to understand and very comprehensive, including the images.

5. Small Group Trial

Table 8. Results of Student Responses/Evaluations

No	Assessment Aspects	Respondents								Total Score	%
		A	B	C	D	E	F	G	H		
1	Quality of appearance (proportional between color, text, and images)	5	4	5	5	5	5	5	5	39	97,5
2	The size and font type used are easy to read	4	5	5	4	5	5	5	5	38	95
3	Clarity of the title and subsections of the digital module on planning and installation of audio-visual systems	4	5	5	5	5	4	5	4	37	92,5
4	The application of media that is easy to understand	5	4	5	4	5	5	5	5	38	95
5	The clarity of the material content with learning outcomes	5	5	5	4	5	4	5	5	38	95
6	The size and font type used are easy to read	4	5	5	5	5	5	5	5	39	97,5
7	The alignment of the image with the text	5	4	5	5	4	5	5	5	38	95
8	User-friendliness of the menu/tools in the digital module	4	5	5	5	4	5	4	4	36	90
Total Score		36	37	40	37	38	38	39	38	37,87	94,68
Percentage (%)		90	93	100	93	95	95	98	95		

Source: Research Document, 2023

The results of the small group trial, presented in **Table 8,** show an average score of 37.87 with a percentage of 94.68%, indicating that the digital module for planning and installing audio systems meets the efficiency criteria and does not require revision. Additionally, the students provided positive feedback and responses. The comments from the students after using the digital module for planning and installing audio systems are as follows: 1) The digital module is sound and its use is easy to understand; 2) The images and videos presented are easy to understand; 3) The material in the digital module is easy to comprehend.

6. Evaluation

The results of the effectiveness analysis of the learning module met the established criteria for effectiveness. The research on the module's effectiveness used the gain score formula. Based on the cognitive test results of the students, derived from the pretest and posttest scores, the average score obtained was 76.38%, categorized as high (effective). This indicates that the students initially had low pretest scores regarding their basic understanding of the material. However, after learning with the digital module, they could comprehend the material well, resulting in higher posttest scores than their pretest scores. Therefore, it can be stated that the digital module media is a valid, practical, and effective medium for use in the learning process.

Discussion

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Advantages of Digital Modules

The digital module developed in this research has progressed through the stages of development using the ADDIE development model. Based on the research that has been conducted, several fundamental assumptions in the development of this digital module are due to the conditions of distance learning requiring students to access learning materials digitally using mobile devices, learning that is more focused on a thorough discussion, and support for varied media as material presentation that includes more than just text. Therefore, students can access complex and practical teaching materials through the digital module. The content presented in the module extends to evaluations and supporting components, enhancing the module's appeal as an engaging teaching resource. In line with the characteristics of the digital module, it is self-instructional, self-contained, stand-alone, and user-friendly. There are several specific characteristics of the module as teaching materials, which are: a) in the smallest yet complete form of learning material; b) implementing a systematic set of learning activities; c) establishing clear and specific learning goals; d) facilitating students' independent learning; e) in the form of the realization of individual differences in learning abilities and the embodiment of individualized instruction (Khoirudin, 2019).

Based on the research findings, it was discovered that the developed digital module positively influences students' cognitive development. In this case, it can be explained that the development of the digital module considers aspects that support students' cognitive development when they use the module independently. Based on the results of the product feasibility test, it can be stated that the completeness of the components in each chapter of the digital module, the clarity of illustrations and captions within the digital module, the accuracy of material presentation, and the clarity of the videos in the digital module received excellent ratings. The validity of the module is supported by the alignment of the design with learning objectives and the scope of the material because, in addition to its relevance to curriculum requirements, the developed material is tailored to the learning outcomes and goals, thus influencing the suitability of the content in the module, for example, supported by various interesting images and videos that are useful for helping students understand the lessons (Antari *et al*., 2023). The sequence of topics discussed also facilitates the proper presentation of the e-modules, making them easier to understand. In addition, the validity of the learning module can be assessed from the aspects or indicators of the curriculum, the content, and its evaluation.

The exercises and evaluations in this digital module are designed based on the characteristics of vocational high school students, who tend to focus more on developing practical skills relevant to their fields of study. In this case, the exercises and evaluations provided are expected to encourage active participation from students in completing project-based tasks or problems. This can support enhancing students' cognitive understanding of their learning concepts. The electronic module, which addresses complex real-life issues, can stimulate students' understanding and should be designed systematically to facilitate independent study (Rambe & Afri, 2020).

The use of digital modules supports the improvement of student learning outcomes because, in addition to being a valid, practical, and effective medium for the learning process, digital modules offer accessibility and flexibility, allowing students to learn at their own pace and according to their individual learning styles. This can increase student engagement by allowing them to choose a comfortable time and place for studying. Interactive digital modules also support the learning process for students, designed with various types of interactive content, such as videos, simulations, and exercises, that make learning more engaging and help students understand the material more easily. In this regard, digital modules can positively influence student learning outcomes as they are tailored to meet students' needs. Research results show that the developed digital modules can gather, trigger, and reinforce students' independent learning methods because the digital modules used as teaching materials have an attractive and interactive design and support a student-centered learning process (Rizal, 2023).

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Factors That Support the Use of Digital Modules

Teachers play a crucial role in fulfilling their primary responsibilities as professional educators. The quality of teachers significantly influences the quality of the education system; as the quality of teachers improves, so does the quality of teaching activities in schools. Additionally, adequate and proper facilities can undoubtedly enhance the quality of educational services and facilitate teachers' learning activities. Such comprehensive facilities strongly support using digital modules as media and learning resources; furthermore, using digital modules can also efficiently reduce paper consumption.

The digital module can display learning materials in various formats through electronic devices such as computers and smartphones, including text, images, animations, and videos. The digital module serves as a presentation of self-directed educational materials to achieve specific learning objectives, systematically organized into the most minor units of instruction, presented electronically, which include audio, video, animations, and navigation to help users interact more with the learning materials (Cahyanto & Afifulloh, 2020)—using digital modules as learning materials will facilitate students' access to and acquisition of information related to educational content in a digital format. Digital modules will be easier to use at home or anywhere, anytime, both inside and outside the classroom, serving as a learning medium that supports self-study methods for students.

Limitations of Digital Module Use

The digital module can be used as a solution to students' problems in online learning (Fradila *et al*., 2021). To overcome this problem, researchers have prepared a PDF version that can be accessed offline when the network is unstable, and it can also be accessed through the web version of the digital module. The development of digital modules using Canva also has limitations. Canva requires an internet connection to use it. In the Canva application, you can find paid templates, stickers, illustrations, backgrounds, fonts, animations, and free templates. Therefore, developers must be creative in adapting to the needs of students (Pelangi & Syarif, 2020).

CONCLUSION

This research aims to determine students' needs for a digital module for the Planning and Installation of Audio Systems at SMK Negeri 10 Makassar. Based on the needs analysis results, it was found that students require a digital module that includes text and images, as well as instructional videos, to facilitate an understanding of the material. Following this analysis, the research proceeded to design and develop a digital module that meets the needs of students. The digital module was developed through validation, practicality, and effectiveness stages. The research results indicate that this digital module is valid, practical, and effective. This module can be accessed online, supports independent learning, and enhances students' learning outcomes. The designed digital module can support the learning process for students and teachers, allowing for its use at any time and from any location. This module aims to create a more engaging, practical, and less monotonous learning experience with interactive features such as videos, images, and exercises. This digital module is expected to positively impact students' learning outcomes and provide a more meaningful learning experience at SMK Negeri 10 Makassar.

The author recommends further research in the development of exploration modules for the use of digital modules in other subjects and educational levels to assess the effectiveness and adaptability of the modules; Long-term Evaluation: through longitudinal studies to reveal the long-term impact of digital

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modules on student learning outcomes; Technology Development by examining solutions to address internet network limitations and improve accessibility and functionality of the design applications used.

AUTHOR'S NOTE

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