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Education Module as a Learning Aid for Fantasy-Based Materials via Local Area Network (LAN)

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Abstract: Fantasy Education Module is intended to enhance early childhood learning with engaging and interactive learning media. A wireless local area network (LAN) module has been developed for writing, reading and coloring activities to support and enhance classroom productivity. The system provides deeper learning of educational content with multimedia interactive features that can engage younger children in the topics. This paper examines the impact of LAN module design with interactive elements on children's teaching methods and learning outcomes, concentrating specifically on the role of interactive design in skill development. The study aims to identify the effectiveness of LAN based Module design in improving teaching and learning outcomes with particular attention to how interactive elements can ensure better skill development. The study investigates whether LAN technology, in an interactive environment that supports leisure time, can complement learning spaces better than those traditionally provided. Findings from the primary studies indicate significant learning improvements with more interactive media used, related to cognitive or motor skills. Active participation, and customized learning modes are the themes of the module to meet individual learner styles and task levels. The results of the study show that these modules have great potential as effective educational agents in early childhood education can add much-needed dynamism to basic skills learning.

Keywords: Early Childhood; Fantasy; LAN; Educational Modules; Multimedia.

1. Introduction

Over the past few decades, the field of information technology has grown astonishingly, and that development has reshaped many aspects of our lives including education [1]. Technology is no longer just a complement, it has become part of the learning process and a new front to expand student engagement and efficiency [2][3]. The application of interactive media in early childhood education is recognized to provide more fun, utility, and facilitate learning [4]. LAN modules as a new representation of technology in education to support real-time collaborative learning Local Network [5][6]. Traditional teaching models (textbooks and blackboards) tend to lack the ability to attract students' attention and suit a limited range of learning styles. However, interactive media offers a more experiential and interesting learning method because students can be closer to interacting directly with the subject [7][8]. This media not only functions as a supporter in learning activities, but the media is also able to stimulate students' desire to learn and act as a medium in the communication process in the classroom [9]. Computer-based media, such as the use of Adobe Flash can make learning more interesting and interactive [10]. Learning media not only reduces limitations in delivering material but can also motivate students who previously felt bored to be more involved in learning. Firmansyah stated that the application of learning media can increase the efficiency of learning and learning achievement of students' work [9].

The results of Suryadi (2017) study showed that LAN-based educational modules with Macromedida Flash can be used as learning media for Playgroup students, especially fantasy learning [10]. The modules developed are activity-centered (reading, writing, and singing) which aim to deepen student involvement in learning. Sustainability (2021) as stated by Hulu *et al*. (2023) builds a flipbook-based e-module with more fantasy stories to increase student involvement [4]. Andriani (2023) conveyed the development of e-module teaching materials that use discovery learning and improve student learning outcomes [1]. Ula & Fadila (2018) have developed e-modules for the development of junior high school number pattern learning content Learning Content [10]. Existing research has shown the promise of LAN-based modules and interactive media in learning, but it remains an open question whether it is possible to utilize LAN networks to encourage simultaneous student access everywhere to the learning system. This study examines LAN-based educational modules that can be effective learning aids while helping teachers manage classes with real-time material control. In addition, Fausih & Danang (2015) conducted research on the development of e-module media for the LAN Network Installation Productive course [2].

One of the uniqueness of this study is the system design that allows teachers to see student engagement directly. This module then uses various types of media for teachers to provide cognitive activities such as reading, writing, coloring, singing integrated with LAN to foster cognitive behavioral motor skills. Unlike how games are taught traditionally, this method can make learning more fun and interesting. In this case, Surya *et al*. studied the contribution of empowering the leading sub-sectors of the creative economy to the quality of creative human resources and economic growth [7]. Suryani *et al*. (2018) used interactive web-based learning multimedia as a medium to assess the standard of LAN installation skills among vocational high school (SMK) students in Padang [9]. Novitasari *et al*. (2021) Web-Based E-Module Design Like Science Learning Media as Learning Materials for the Use of SMA Science Sepanggahan Waves [5]. The purpose of this study was to design a LAN-based educational module to increase student participation, to validate the impact of its socialization on cognitive and motor skills and thus see the effectiveness of the LAN Network for Managing Simultaneous Learning Processes in the Classroom. Putra *et al*. (2020) Design of Mathematics Learning Media in High School Using Smartphone Learning Management System (S-LMS) [6]. Sakti & Ofianto (2021), explained that the design of an e-module for the history of the South Coast region with the topic of learning Inderapura Kaisberg in the introduction to Indonesian Cryptography. The same thing was done by Agustini *et al*. (2022), where the Efficiency of using e-modules with a guided inquiry approach as teaching materials for Mushroom material for class X SMA [12]. With the results of the study, researchers can make a major contribution to developing technology-based educational modules, especially in encouraging learning in the early years.

2. Related Work

In developing technology-based learning modules or the integration of ICT with the learning process has attracted much attention in education as information and communication technology (ICT) becomes more algorithmically embedded in learning activities. Past studies have investigated various methods for developing, developing, and implementing digital learning modules with a focus on improving learning performance, student engagement, and learning outcomes. Research in this regard has mainly concentrated on the development of mobile materials or e-learning (e-modules) as flexible and easily accessible self-study repositories. Hulu *et al*. (2023) Investigated the use of flipbook format in e-modules to improve understanding of fantasy-type story material through student interest [4]. Interactive formats can help attract students'

attention and process complex material providing additional tools to facilitate learning. Andriani (2023), e-modules in energy materials, integration of discovery learning approaches with PhET simulations that improve student learning outcomes [1]. This exploratory study shows that letting students come and experiment/experience scientific concepts themselves not only makes learning concepts more memorable but also more internalized. Ula & Fadila Based on Learning Content Development System (LCDS) Development of e-modules for junior high school number pattern topics [3]. The importance of having high-quality content development in e-modules is one of the main themes emphasized by this study, urging the use of a structured and user-friendly platform for such tasks. Novitasari *et al*. (2021) built a web-based e-module as a high school physics learning material on sound waves [5]. This paper underlines the benefits of online platforms to provide on-demand, safe, and secure access for students to learning materials and robust devices. Agustini *et al*. (2023) examined the feasibility of a guided inquiry-based e-module as a teaching material for grade X of high school [12]. The results showed that the guided inquiry approach can improve students' critical thinking and problem-solving skills as well as understanding of scientific concepts. In addition to the development of web-based e-modules, several studies have also investigated the role of mobile applications and learning management systems (LMS) in learning. Putra *et al*. (2020) Development of Smartphone Learning Management System (S-LMS) As A Mathematics Teaching Media In High School [6]. Research shows that smartphones are an efficient tool for providing learning materials and interaction between students and teachers.

In network-based learning, Suryadi (2017) studied the design of an education module application using Macromedia Flash as a teaching aid for fantasy material for Playgroup children based on Local Area Network (LAN). This study provides initial evidence of the potential use of LAN to support interactive and collaborative learning in the classroom environment [8]. Fausih & Danang (2015) developed e-module media for productive subjects on the topic of LAN network installation for vocational high school students. This study emphasizes the importance of learning materials that are relevant to practical skills and industry needs [2]. Suryani *et al*. (2018) used interactive web-based learning multimedia to assess the competency standards for installing LAN among vocational high school students [9].

Desfita (2020) examined the use of interactive multimedia based on children's worksheets to improve listening and reading skills in early childhood (5-6 years) [13]. This study underlines the importance of attractive and interactive design for early childhood learning, which is relevant to the consideration of interface design in this study. In addition, this study considers aspects of information system security and audit, which are relevant in the implementation of LAN-based learning modules. Research by Elhaq & Lestari (2022) on risk analysis of online exam websites [14], Yusuf & Syaputra (2022) on IT audits using COBIT 2019 [15], Nurlistiani *et al*. (2021) on e-learning audits with COBIT 5.0 [16], and Sumardiono (2020) on business analysis in strategic planning of information systems [17], provide relevant frameworks and methodologies to ensure the security, reliability, and effectiveness of the developed learning modules. This study also adopts the principles of Model-View-Controller (MVC) in system development, as implemented by Syazili & Effendy (2020) in the public complaint information system, to ensure a modular, easy-to-maintain, and further developable code structure [18].

Previous studies have analyzed this topic at different scales and cases, but the current study also differs in terms of features and makes a unique contribution compared to other studies. The study aims to build an interactive learning module for LAN environments and considers the specificities of LANs in terms of the specificities and possibilities that LANs offer for networking. In addition to research on web-based e-modules or m-learning, the current study investigates how LANs can be used to provide a more timely, student-centered and inclusive learning experience in a classroom environment. The study is based on a student-centered learning design considering the different learning styles and individual requirements of students. The created learning module gives students the freedom of choice by fulfilling all their curiosities and essentials thus allowing easy access to students at a pace that is only known to them. Various interactive media (simulations, animations, videos, and games, etc.), embeddings can be used to enrich and enrich the learning experience. The use of these interactive media is predicted to increase student engagement by leading to better mastery and understanding of complex concepts; long-term information retention In this work, a comprehensive evaluation has been conducted to measure students' learning achievement; level of engagement, satisfaction and perceived usefulness of the learning module. The data will be used to map some of the holes and gems in the learning modules, which in turn will help further improvements to be directed towards developing and enhancing the understanding and practice of how LAN technology can be used more effectively as a medium through which quality classroom-based learning can be conducted and provide practical guidance to educators and educational software developers on what works best for creating innovative interactive learning modules.

3. Research Method

3.1 System Design

The educational module developed in this study includes four main activities designed to stimulate various skills of early childhood students, namely:

1) Reading
   This module facilitates the teaching of letters, words, and simple sentences through interactive text and audio media.
2) Writing
   Involves practicing writing skills with visual guidance on the screen, helping students recognize the shape of letters and numbers.
3) Coloring
   Digital coloring activities that aim to stimulate students' creativity, with a selection of various images of animals, plants, and other objects.
4) Singing
   This module offers educational songs that teach vocabulary and train students' memory through interactive music.

Macromedia Flash 8 software, known to enable the creation of interactive animations, is used in the design of this system. Each student's computer is connected to a server, which functions as a control center, via a local area network, or LAN, which is used to implement this system. Module data is sent to the student's client computer by the server. This allows teachers to supervise teaching materials, supervise student interactions, and monitor student progress in real time. The structure of this system consists of several main components:

1) Server
   As a control center, the server is responsible for distributing educational modules, storing student data, and managing connections between computers in the network.
2) Client
   Each student uses a client computer connected to the server via a LAN network. This client computer is used by students to interact with the modules, carry out activities such as reading, writing, coloring, and singing.
3) LAN Network
   The LAN network connects the client computer to the server, allowing fast and efficient data transfer, and facilitating data sharing that supports direct student interaction with teaching materials.

The implementation of LAN allows modules to be used in large classes while maintaining effective teacher control. This allows all students to access the same material simultaneously or according to teacher settings through the server.

3.2 Data Collection Methods

This study collected data through various methods to ensure the efficiency and effectiveness of the developed system:

1) Interviews
   Interviews were conducted with teachers and students at Playgroup schools to obtain views on technology-based learning. Teachers provided input on learning needs, while students provided responses on their involvement and interest in the material presented through interactive modules.
2) Direct Observation
   Observations were conducted during the learning process to evaluate how students interact with the module. Observations were also conducted to see how students responded to various activities in the module, such as reading, writing, coloring, and singing, and their impact on student engagement in class.
3) System Testing
   The system was tested technically to ensure that the LAN network functioned properly in supporting synchronous activities between the server and client. In addition, non-technical testing was also conducted to measure the effectiveness of the module in improving student learning outcomes, including improving cognitive and motor skills.

3.3 System Development Methods

Context diagram provides a complete picture of the system and its relationship with the user. In this diagram, the user initiates the system by providing input through devices such as keyboard and mouse, interacting with buttons displayed on the monitor screen, and the speaker provides sound in response.

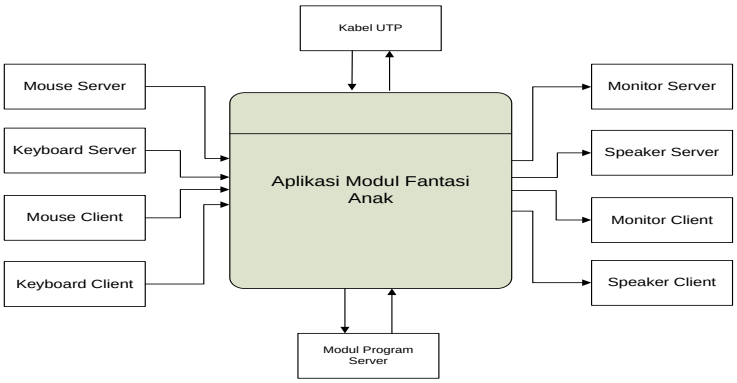

Figure 1. Context Diagram

The system architecture of the Children's Fantasy Module Application is depicted in a block diagram. This system is based on a Local Area Network (LAN), which uses UTP cables as a data transmission medium between the server and client. At the center of the diagram is the module application, which functions as the core of the system and regulates all learning activities. On the server side, teachers use input devices in the form of a mouse and keyboard to provide instructions to the system, as well as monitors and speakers that display visual and audio displays from the application. On the client side, students use the same input devices to interact with the module. The client's monitor and speakers display the application display and output program sounds. While the server program module functions as a control center that regulates the distribution of learning materials and data management to the client computer, UTP cables connect the server and client, enabling efficient data transfer. This diagram shows how the input-output devices on the server and client are integrated via a LAN, enabling well-managed interactive learning.

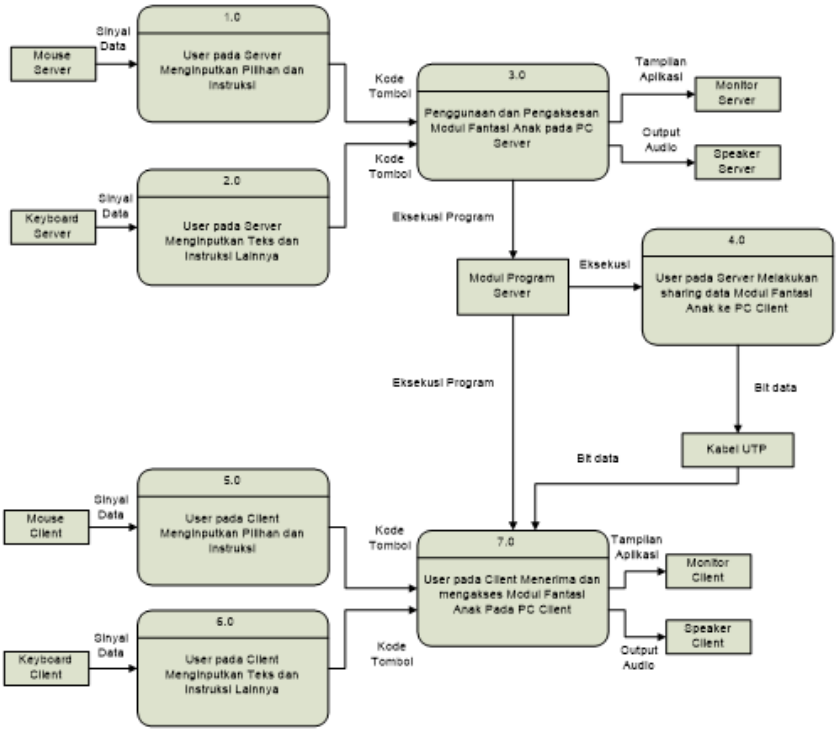

Figure 2. Data Flow Diagram Level 0

The Children's Fantasy Module is connected to the server and client via a UTP cable over a LAN network, as shown in the diagram. There are two main inputs on the server side. The server's mouse is used to select and give instructions, and the server's keyboard is used to input text and other instructions. After the server accesses the program module running on the server computer, the user can operate the module and share data with the client. This process is described in the blocks "Using and Accessing the Children's Fantasy Module on the Server PC" and "Performing Data Sharing". Data and instructions shared with the client are processed and received through the client's mouse and keyboard, which students use to provide input to the module on their computers. Students can access the educational module through the client's monitor and speaker after

the data is received. This process shows the synchronous relationship between the server that controls and shares content and the client that receives and interacts with the educational module in real time.

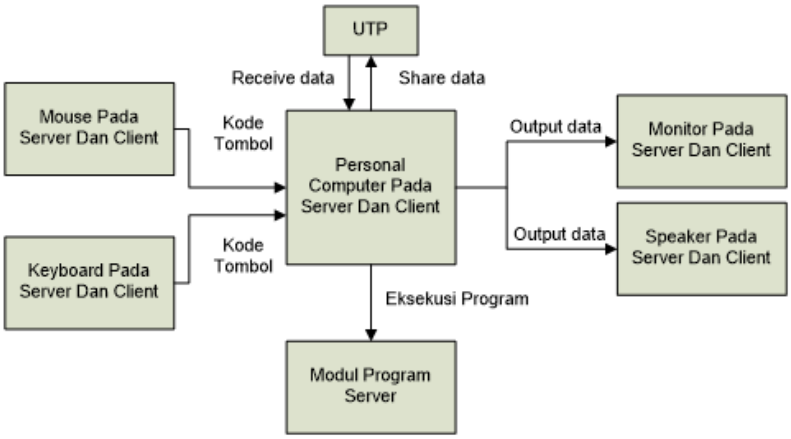

Figure 3. Block Diagram

In running the Program Module through the UTP network, the system workflow between the server and client is depicted in this diagram. In this diagram, the keyboard and mouse connected to the server and client are used to send key codes to the computer on each side of the server and client. Next, the computer processes this input and sends data through the UTP network. The data received or sent is divided into two streams: receive data to receive data from the network and share data to share data to the client from the server. After the data is processed, the computer outputs data that is displayed through the monitor and speakers on the server and client sides, providing a visual and audio display of the program being run. The Server Program Module produces this run program. This module gives full control to the server to share materials and manage input and output interactions across the network.

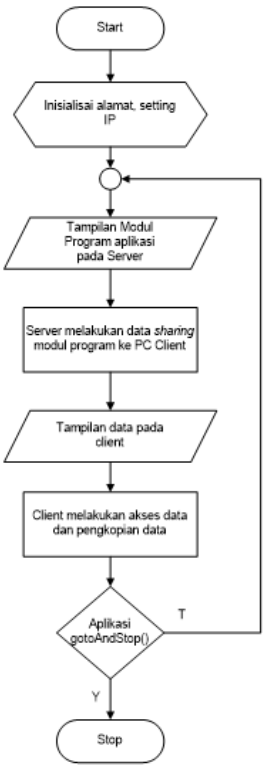

Figure 4. Flowchart

The data sharing process flow in a local area network (LAN)-based educational module is depicted in the flowchart. After activating the IP address, the application program module is displayed on the server screen. Next, the server shares the module data to the client PC connected to the network. The shared module data will be displayed on the student's computer screen on the client. This allows students to access and copy the data they need. The final step is to run the application with the gotoAndStop() command. This command gives

the module the ability to run or stop certain activities based on the input provided. The entire workflow is complete when the process ends with the "stop" condition.

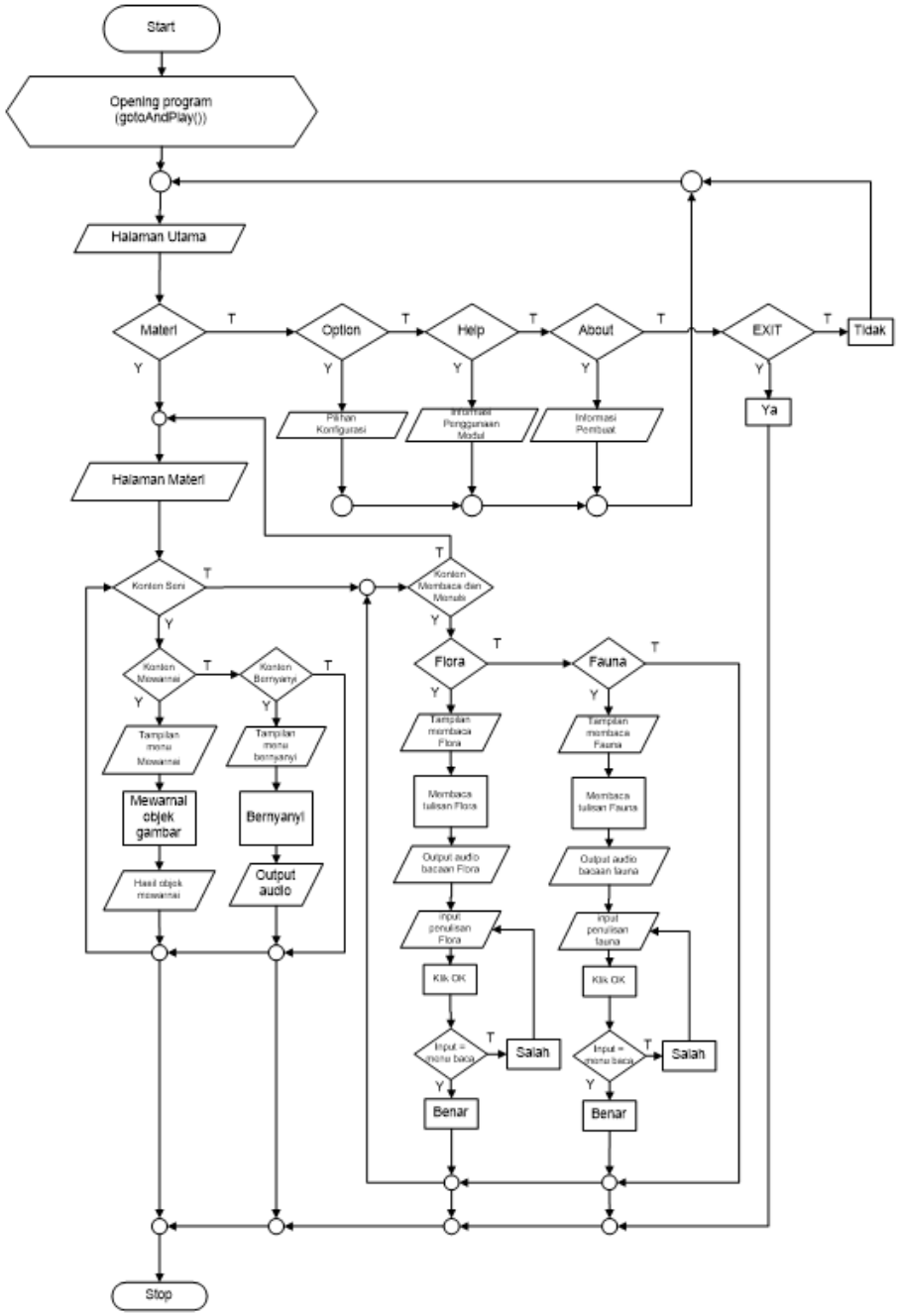

Figure 5. Flowchart in the Program Module

The interactive flow of a multimedia-based educational module consisting of various learning materials is shown in the flowchart. Starting by opening the program with the gotoAndPlay() command, the user is directed to the Main Page which displays options such as Materials, Options, Help, About, and EXIT. If the user selects Materials, they are directed to the Materials Page, which displays content options such as Art, Coloring, Singing, and Reading, with subcategories of Flora and Fauna. Each choice takes the user to an activity. For example, the Coloring Content gives the user the ability to color a picture, while the Singing Content gives the user the ability to play a song. In the reading and writing materials, students can choose between flora or fauna, where they will read text associated with audio output. Then, they are asked to insert the associated text into their work. The input will be confirmed as "Correct" if correct, while if incorrect, the message "Incorrect" will appear. The "Stop" command marks the end of the activity in the learning module in this section.

4. Result and Discussion

4.1 Results

The test was conducted on 30 students in one of the Playgroup schools, by collecting data before and after the implementation of the module. Data were collected through direct observation, questionnaires, and analysis of teacher notes. The results of the study showed significant improvements in various aspects of learning, which will be discussed in more detail below.

4.1.1 Increasing Student Engagement

One of the main objectives of developing this module is to increase student engagement in the learning process. Student engagement is measured based on four main categories: focus on the material, active participation, cognitive performance, and motor skills. Table 1 summarizes the data on the increase in student engagement before and after the use of the module.

Table 1. Increase in Student Engagement Before and After Using the Module

Engagement Categories	Before Module	After Module	Increase (%)
Focus on the Material	60%	85%	25%
Active Participation	55%	80%	25%
Cognitive Performance	65%	88%	23%
Motor Skills	70%	90%	20%

Table 1 shows that this module has made many efforts to improve student engagement according to the data. It is calculated as (60% to 85% increase in attention to materials from LAN-based interactive multimedia modules compared to offline learning)—which shows that interactive multimedia is a more efficient way to attract students' attention in this LAN-based module compared to traditional learning methods. Because of elements such as animation, sound and so on, it is a more interactive and interesting learning method, therefore students find it easier to engage their visual attention when the materials are presented. The increase in the percentage of active participation by 55→80%, this shows that students are getting deeper, and more involved in learning. In this module, students learn to handle materials and do various student activities such as Q&A, coloring, and singing. Quizzes, exams, or short answer questions do not provide such personal learning, because they allow students to only memorize texts from books, and cannot be remembered in the long term because they are not actively involved in the learning process. Based on these results, the overall improvement in cognitive performance increased from 65% to 88%, thus indicating that this module will improve students' thinking and problem-solving skills. The activities of this module are designed to engage various cognitive processes (executive functions of memory) – attention and reasoning. This includes reading and writing, for example to improve reading and writing skills and coloring or, singing to unleash creativity, imagination. This improvement, makes motor skills from an aggregate of 70% increase to 90%, because this module can facilitate the stimulation of eye-hand coordination of students' fine motor skills. tasks in the module; and some series of activities using the mouse or typing that help students develop fine motor skills and coloring that helps improve eye-hand coordination.

4.1.2 Effectiveness of LAN Network Usage

In the scope of this educational module, the use of LAN networks presents very significant advantages, which specifically involve efficiency and class administration. Furthermore, by using LAN networks, teachers can deliver lessons to all students at once and at the same time without having to deliver them one by one, thus saving time and effort. Furthermore, LAN networks ensure that all students follow the same instructions and lessons at the same time, minimizing the possibility of misunderstandings or students falling behind. LAN networks also allow teachers to monitor student progress in real-time. When an assignment/module is activated, teachers can, on their own machines, view student activity in real-time, monitor their progress in completing the tasks given as part of the module, and interrupt directly if necessary. LAN networks will not only increase the speed of learning but also allow for a more concentrated learning environment that ensures that each student can learn according to their learning ability. Students get instant changes (updates to materials) that are managed directly by the teacher based on fast and effective communication between the server and the client. For example, new materials or changed assignments can be sent immediately to all student computers without manual steps that are often time consuming. This keeps the learning process running in line with the changing needs and learning behavior of students.

4.2 Discussion

The results of the study showed that the integration of Educational Modules as Learning Aids for fantasy-based materials via a Local Area Network (LAN) significantly improved student engagement and learning

outcomes. This finding is in line with existing literature that emphasizes the benefits of interactive technologies in educational settings [19][20]. Interactive learning technologies have been recognized for their ability to foster more engaging and personalized learning experiences compared to traditional methods, which often lack interactivity and adaptability to individual student needs [19]. The use of multimedia resources and real-time feedback mechanisms within a LAN framework enables a dynamic classroom environment where students can actively participate and collaborate, thereby enhancing their overall learning experience [21].

The effectiveness of LAN-based educational modules is supported by studies highlighting the importance of a learner-centered approach that promotes engagement and interactivity [22][23]. These studies indicate that when students are given the opportunity to engage with content interactively, their satisfaction and knowledge retention increase. The direct control that teachers have over the LAN network facilitates effective classroom management, allowing for tailored instructional strategies that cater to diverse learning styles [24]. This is in line with findings that suggest that technology-enhanced learning environments can produce better educational outcomes by promoting collaborative learning and critical thinking skills among students [20]. Suryani, *et al*. (2018) found that the use of interactive web-based learning multimedia can effectively assess competency standards for LAN installations among vocational high school students in Padang, Indonesia [9]. These findings support the idea that interactive technology can be a valuable tool for improving students' practical skills. In addition, the development of a web-based e-module as a physics teaching material on sound wave material in high school shows the potential of web technology in providing easily accessible and interactive educational resources [7].

However, as with all research, it is important to recognise the limitations of the current study, particularly in terms of sample size and geographical location of the study. The sample size was relatively small, at 30 students, and although the findings paint a clear picture of family life in one Playgroup school, it limits generalisability [25]. However, larger and more diverse samples exploring a range of educational settings are needed to validate the wider applicability of LAN-based educational modules. This would provide a broader picture of how technology can be effectively implemented in a range of educational settings [26].

The implementation of Educational Modules as Learning Aids through fantasy-based materials over LAN can improve student performance and interest. These are typically interactive systems containing multimedia elements and examples provided and real-time feedback, reflecting current educational trends, which focus on learner-centred learning. However, further research is needed to assess the wider applicability of these findings across a range of educational settings. This can also be a topic for further research to increase students' interest in learning using Flipbook-based e-modules [4], and by proposing the development of a Smartphone Learning Management System (S-LMS) as a medium for learning mathematics in high schools [8].

5. Conclusion

The results showed that the use of this module significantly increased student engagement in the learning process, as reflected in increased focus on the material, active participation, cognitive performance, and motor skills. In addition, the use of a LAN network facilitated more efficient classroom management, allowing teachers to deliver learning materials simultaneously, monitor student progress in real-time, and provide personalized guidance. These findings are in line with existing literature that supports the use of interactive technology in education to improve student engagement and learning outcomes. LAN-based educational modules provide a more engaging, interactive, and personalized learning experience compared to conventional learning approaches. Although the study provides promising evidence for the potential use of LAN-based interactive educational modules, it is important to acknowledge its limitations, especially related to the small sample size and limited research context. Further research with a larger sample size and in various educational settings is needed to confirm the results of this study and explore the wider application of LAN-based educational modules. Therefore, the researcher can conclude that LAN-based interactive educational modules have significant potential to improve the quality of learning in Playgroup environments. This module can be an effective tool for teachers to increase student engagement, monitor student progress, and manage classes efficiently. However, the implementation of this module must be supported by adequate teacher training, reliable technological infrastructure, and ongoing evaluation to ensure its long-term effectiveness.

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