TPM Vol. 32, No. S2, 2025
ISSN: 1972-6325
https://www.tpmap.org/

UTILIZATION OF DIAGNOSTIC MULTIPLE INTELLIGENCE SYSTEM (DMIS) APPLICATIONS TO DIAGNOSE INTELLIGENCE AND PROVIDE DIFFERENTIATED DIGITAL CONTENT TO OPTIMIZE LEARNING OUTCOMES

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Abstract: Multiple Intelligence is a type of Intelligence that is very much needed in facing the challenges of the 21st century. Multiple intelligence-based learning is not yet widely available and is still challenging to implement in schools. Not many teachers have developed and empowered this Intelligence in learning. Learning still emphasizes IQ intelligence and only focuses on a few bits of Intelligence. Thus, the Diagnostic Multiple Intelligences System (DMIS) was developed to diagnose students' intelligence types, recommend strategies, and differentiate digital content for students. The objectives of this study were 1) to test the validity of DMIS, 2) to test its practicality through group trials, and 3) to test the effectiveness of multiple intelligences-based digital content differentiation to improve learning outcomes. DMIS was developed in stages using the ADDIE development model. Design experts, learning technology/curriculum experts, and content experts tested the validity of DMIS. Twelve junior high school students conducted the practicality test. The results showed that DMIS obtained a very good category from design, media, and learning content. Meanwhile, the practicality test by junior high school students received a very good category. The t-test results show that digital content differentiation using multiple intelligences available in the DMIS application can improve student learning outcomes.
Keywords: multiple intelligences, learning outcome, differentiation

INTRODUCTION

Multiple Intelligences (MI) based learning creates an approach that understands that every child has diverse Intelligence and can be developed through differentiated learning methods and media. Children at junior high school age are experiencing the development of their Intelligence in various fields. The MI approach provides an opportunity to identify and develop the child's potential. The development of these abilities cannot be separated from the role and assistance of a teacher (Mulyasa, 2008; Suwatra et al., 2019). Teachers must know the nine types of Intelligence that children have as expressed by Howard Gardner, namely (1) linguistic intelligence, (2) logical-mathematical Intelligence, (3) musical Intelligence, (4) spatial Intelligence, (5) bodily-kinesthetic Intelligence, (6) naturalist intelligence, (7) intrapersonal Intelligence, (8) interpersonal Intelligence, and (9) existential Intelligence (Gardner, 1999, 2004).

Multiple intelligences are types of Intelligence that are very much needed in the challenges of the 21st century, but learning based on multiple intelligences has yet to be widely applied in schools (Ferrero et al., 2021; Setiawati, 2019; Sudarma & Tegeh, 2019). Likewise, only a few teachers have developed and empowered these intelligences in learning. School learning generally emphasizes IQ intelligence and focuses on only a few Intelligence, such as language and mathematics intelligence (Sudarma & Tegeh, 2019; Widiana et al., 2021). The learning system also tends to use a curriculum common to all students, is didactic, and is time-based. It also uses the concept of rewards and punishments to assess students. This approach is considered less able to arouse students' talents and interests (Fiorella & Mayer, 2021; Sudarma et al., 2019; Sudarma & Ilia, 2021)

Some people still consider Intelligence to be identical to IQ. Empirically, Intelligence is no longer based on psychological tests such as IQ tests but on problem-solving and creativity abilities. (Adi, 2016). Problem-solving and creativity align with the skills needed in the 21st century, namely, 4C (critical thinking, creativity,

communication, and collaboration) (Redhana, 2019). Between multiple intelligences and 21st-century skills, there is a strong connection and mutual support. For example, communication skills are related to interpersonal Intelligence. If interpersonal Intelligence is well developed, the child can communicate well. Likewise, critical thinking and problem-solving correlate with intrapersonal Intelligence. Intelligence (Sudarma et al., 2019). If a child's intrapersonal Intelligence is adequately developed, their critical thinking and problem-solving abilities will also be optimal (Rejeki & Isharyanti, 2020). Measuring multiple intelligences in students is still a challenge for most teachers.

There are various ways to facilitate children's multiple intelligences, such as developing strategies, learning resources, and learning media. Media greatly helps the effectiveness of delivering material (4,18). Media design that focuses on information processing theory can make it easier for students to understand the subject matter (Sudarma & Ilia, 2021). In this study, DMIS is based on Ubiquitous Learning to diagnose and recommend strategies and media and provide virtual learning spaces for students according to their respective potentials. Strategy recommendations and The media will refer to Mackenzie's theory (McKenzie, 2005), namely the suitability between the type of Intelligence and the strategy and media used. The virtual learning space will use the concept of Ubiquitous Learning. Ubiquitous learning provides flexible access to learning strategies and resources.

Until now, there has been no development of a system that is able to diagnose multiple intelligences and provide a learning space according to the type of intelligence. The novelty of this research lies in the combination of information technology with multiple intelligence strategies and differentiated learning pedagogy. The learning space provides a variety of digital content for learning. DMIS plays a role in identifying and providing online-based learning space. DMIS is designed to help identify and understand multiple intelligences possessed by students. This system can provide insight into the strengths and weaknesses of students' Intelligence and recommend more personal and differentiated learning strategies and media. Then, the virtual learning space allows students to access learning materials using various devices such as computers, smartphones, tablets, or other devices. This provides flexibility in choosing the time and place to study.

Differentiated digital content plays an important role in learning because it can be tailored to the needs and characteristics of diverse students. Differentiation of digital content based on multiple intelligences allows teachers to adjust teaching materials based on students' readiness, interests, and talents. Digital content such as videos, images, and interactive quizzes can be presented to meet students' various learning preferences, thereby improving their understanding of the material (Yury Setiawan et al., 2024). The use of technology in differentiated learning can increase student engagement. Interactive and interesting content can make students more active in the learning process, which in turn increases their motivation to learn (Yahya et al., 2024). Digital content allows students to learn at their own pace. Students can access materials anytime and anywhere, supporting independent learning and providing opportunities to explore topics more deeply according to their interests. By utilizing data from various sources, teachers can understand students' individual learning needs and adjust content and teaching methods. This creates a more personalized and relevant learning experience for each student. Based on this, the problem formulation in this research is as follows:

1. What is the validity of DMIS in terms of design, media, and learning content?
2. How practical is DMIS when used by students?
3. How effective is multiple intelligences-based content differentiation in DMIS applications in improving learning outcomes?

METHODS

DMIS Development Stages

This research is development research. It uses the ADDIE model (Branch, 2009), which consists of five stages: 1) analysis, design, development, implementation, and evaluation. This selection is based on the fact that ADDIE is a generic model, the flow is easy to follow, and several studies using this model have had a positive impact (Arifin et al., 2018; Fitriyah et al., 2021; Yu et al., 2021). The activities carried out at each stage are as follows.

ANALYSIS STAGE

At this stage, the following are carried out: (1) analysis of student characteristics, (2) analysis of curriculum, (3) analysis of facilities and infrastructure and learning resources. Student characteristics are analyzed to determine the variety of intelligence, learning styles, and learning interests. Curriculum analysis is carried out to determine the curriculum in force in schools so that it can be applied. Analysis of facilities and infrastructure is related to the infrastructure that supports the use of the application being developed. Analysis of learning resources is related to the availability of media and teaching materials used to develop multiple intelligences in schools.

DESIGN PHASE

At this stage, the following activities are carried out: (1) mapping types of Intelligence with types of strategies and learning media, (2) designing application flowcharts, and (3) designing diagnostic instruments. Multiple intelligences, (4) designing ubiquitous learning spaces learning.

DEVELOPMENT STAGE

At this stage, the following things were done: (1) realizing the design into an application, (2) DMIS validity test by three experts, (3) DMIS revision 1, (4) practicality test by students (12 students), (5) revision 2.

IMPLEMENTATION STAGE

At the implementation stage, a quasi-experiment was conducted to determine the effectiveness of differentiated digital content in the DMIS application in improving learning outcomes. The experimental design used was a one-group pretest-posttest design.

EVALUATION STAGE

The type of evaluation applied is formative evaluation. This evaluation aims to improve output at each stage of development and test the effectiveness of the application (33).

DMIS Validation and Practicality Test
DMIS was validated by content, learning design, and learning media experts. This expert validation is important to obtain input for improving the developed product and to obtain assurance that the developed DIMIS is feasible for implementation in learning. The DIMS practicality test involved 12 students. After the product practicality test, students completed a questionnaire assessing the product, followed by data analysis and product revision based on the test results to produce a practical product.

RESEARCH INSTRUMENTS

The instruments for testing the validity, practicality, and effectiveness of DMIS are presented in Table 1 below.

TABLE 1. DEVELOPMENT STAGE AND TYPE OF INSTRUMENT

Stage	Objects	Instrument
Analysis	Curriculum	Observation sheet
	Student characteristics	Interview guidelines
	Facilities and infrastructure	
Design	DMIS Learning Design	Questionnaire
	User interface	
	User experience	
Development	DMIS Application	Questionnaire
	Learning Tools	
Implementation	Learning outcomes	Test

The questionnaire used to validate and test the practicality of DIMS from the aspects of media, learning design, and content was adapted from (Branch, 2009; Dick & Carey, 2005; Fleming & Levie, 1978) while the questionnaire used to test practicality was adapted from (Fleming & Levie, 1978; Sudarma et al., 2022).

ANALYSIS DATA

The data obtained from the validity and practicality tests of the application are classified into 2, namely qualitative data and quantitative data. Qualitative data is in the form of criticism and suggestions put forward by experts. This data is used to improve DMIS. Quantitative data in the form of scores were analyzed using descriptive statistical analysis techniques to determine the quality of the DMIS developed. The scores obtained were then added up and averaged. Next, the converted becomes marked with the use of table criterion-referenced test scale5, as served in Table 2.

TABLE 2. CONVERSION SCORE BECOMES MARK ON SCALE FIVE

Achievement Level (%)	Qualification	Description
90–100	Very good	No need to revise

75–89	Good	Slightly revised
65–74	Fair	Revised sufficiently
55–64	Deficient	Many things revised
0–54	Very little	Repeated making of the product

(average) score) in giving an evaluation of a product That has been developed using the formula: Mean= $\frac{\Sigma X}{n}$
The data obtained through the test were analyzed using t-test statistics with correlated samples.

RESULTS

The presentation of research results is adjusted to the formulation of the research problem. The following is the presentation of the research results.

1. How do you design DMIS?

At this stage, the following activities are carried out: (1) mapping types of Intelligence with types of learning strategies and media, (2) designing application flowcharts, (3) designing multiple intelligences diagnostic instruments, and (4) designing learning spaces based on ubiquitous learning. The results of each stage can be explained as follows.

a) Mapping of Intelligence Type

It is important to mapng the type of Intelligence with the type of learning strategy and learning mednt. The accuracy of the strategy and media will affect the student's learning process. Table showsis a mapping of learning strategies based on the type of Intelligence.

TABLE 3. MAPPING OF INTELLIGENCE TYPES WITH LEARNING STRATEGIES

Types of Intelligence	**Strategy/Method**
Verbal-linguistic Intelligence	• Debate or group discussion. • The activity of writing stories, essays, or poetry. • Reading and analysis of texts or literature. • Word games such as crossword puzzles or Scrabble.
Logical-mathematical Intelligence	• Solving mathematical problems or puzzles . • Science experiment activities. • Strategy games like chess. • Using graphs or diagrams in learning.
Visual-spatial Intelligence	• mind map mapping. • Drawing or creating 3D models. • Use of visual media such as videos or infographics. • The activity of designing buildings or objects using design software.
Bodily-kinesthetic Intelligence	• Movement-based learning activities such as role-playing or simulations. • Experiments involving physical manipulation of objects. • Sports or dance activities that involve body coordination. • Practice-based projects such as crafts.
Musical Intelligence	• Learn to use music or songs as a memorization aid. • Create songs or music related to the subject matter. • Create a rhythm or melody that is related to a particular concept. • Analyze songs and instruments to understand musical structure.
Interpersonal Intelligence	• Group work or collaboration on projects. • Role play or open discussion. • Projects involving communication with the community. • Simulation of social situations or communication games.
Intrapersonal Intelligence	• Personal reflection and journal writing. • Individual goal setting and self-evaluation. • Meditation or mindfulness to increase self-awareness. • Activities that allow students to express feelings or thoughts personally.
Naturalistic Intelligence	• Outdoor learning activities such as nature exploration or

	observation of flora and fauna. • Environmentally based projects such as gardening or conservation. • Relating scientific concepts to natural phenomena. • Discussion on environmental and sustainability issues.
Existential Intelligence	• Inviting students to question their existence • Inviting students to reflect • Make predictions

Source: (Armstrong, 1994)

TABLE 4. MAPPING OF INTELLIGENCE TYPES WITH MEDIA TYPES

Types of Intelligence	Types of Media or Learning Tools
Verbal-linguistic Intelligence	• Books and Texts: Textbooks, articles, essays, journals, and learning modules. • Audio: To listen to narration and stories. • Digital Dictionary or Thesaurus : Expand vocabulary and understand context. • Podcasts or Recorded Lectures: Help students understand the material through verbal explanations.
Logical-mathematical Intelligence	• Mathematical Simulation Software: Software like GeoGebra or Wolfram Alpha to solve mathematical problems. • Scientific and Graphing Calculator: This is used for calculations and data analysis. • Puzzle Apps: Games like Sudoku or logic puzzles that train critical thinking skills. • Interactive Learning Media: Digital science experiment simulation tools. • Graphs and Charts: Visual elements for understanding data and statistics
Visual-spatial Intelligence	• Learning Videos: Animated or documentary videos that help visualize abstract concepts. • Mind Map Mapping Tools: Apps like Coggle or MindMeister for designing diagrams and idea maps. • 3D Models and Maps: Physical or digital tools used to study geometry, geography, or science. • Graphic Design Tools: Software such as Adobe Photoshop or SketchUp to design and create visual works. • Slides (PowerPoint or Prezi): To organize ideas with visual support.
Bodily-kinesthetic Intelligence	• Physical Aids: Anatomical models of the body, sports equipment, or mechanical props that allow for direct physical interaction. • Practical Tools: Laboratory or experimental equipment that allows students to interact directly with learning materials. • Motion Simulation (Virtual Reality / Augmented Reality) Reality): To simulate real environments or physical movements in learning. • Educational Games That Require Movement: Apps or games that combine physical activities, such as Dance Dance Revolution or Wii Fit. • Interactive Whiteboard (Interactive Whiteboard) Whiteboard): Students can interact directly with the content using this tool.
Musical Intelligence	• Musical Instruments: Musical instruments such as piano, guitar, or drums are used in learning. • Music Creation Apps: Software like GarageBand or FL Studio to create and edit music. • Songs or Jingles: Use of songs or rhythms to help remember lesson material. • Music Recording: An audio source containing a musical composition or voice recording for analysis. • Audio Editing Software: Applications for editing or analyzing audio files in a learning context.

Interpersonal Intelligence	• Online Discussion Forums: Platforms like Google Classroom or Moodle to collaborate and discuss with friends. • Collaborative Work Apps: Google Docs or Microsoft Teams that enable real-time group work. • Social Simulation Tools: Simulation games or role-play-based learning tools that help understand social relationships. • Video Conferencing: Media such as Zoom or Skype for direct remote interaction. • Team-Based Educational Games: Games that require teamwork to complete tasks.
Intrapersonal Intelligence (Intrapersonal Intelligence)	• Self-Reflection Apps: Apps like Day One (journal app) or Habitica to track personal development and reflection. • Mindfulness and Meditation Tools : Apps like Headspace or Calm to help students focus and understand themselves. • Motivational and Self-Development Videos: Videos that motivate students to understand and achieve personal goals. • Personal Journal: A simple tool for recording self-reflection, thoughts, and emotional developments. • Personality Questionnaires and Tests: Psychological testing tools that help students understand personal strengths and weaknesses.
Naturalist Intelligence (Naturalist) Intelligence)	• Environmental Observation Tools: Use a microscope, binoculars, or camera to observe flora and fauna in nature. • Plant and Animal Identification Apps: Apps like iNaturalist or PlantSnap help students recognize and understand the species around them. • Nature Documentary Videos: Documentaries that show life in the wild, natural phenomena, or certain ecosystems. • Environmentally Based Projects: Tools and materials for gardening or ecosystem research. • Map or Globe: Used to understand the geography and topography of the world or a particular area.
Existential	• Student worksheet • Inspirational videos

Source: (Gardner , 1999; McKenzie , 2005)

b) Application Flowchart

Flowchart was also created. The flowchart design is presented in Figure 1.

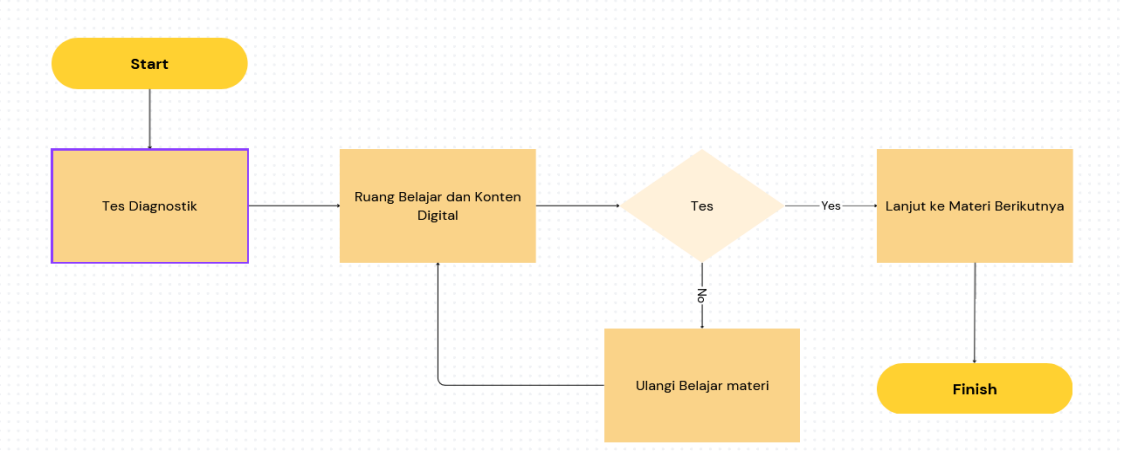


FIGURE 1. DMIS APPLICATION FLOWCHART

DMIS is designed with a simple design. Students can start the application by first diagnosing the dominant type of intelligence in students. After that, students will be directed to a study room that already has digital content. In the study room, students are asked to study hard so they can do the test. If students succeed in doing the test, they can continue to the next material. If the test results are below standard, students are directed to repeat the previous material. The following is a grid of multiple intelligence diagnostic assessment instruments in Table 5.

TABLE 5. DIAGNOSTIC ASSESSMENT INSTRUMENT GRID

Types of Intelligence	Item	Number of Items
1. Mathematics	1. Love math and science 2. Likes to make predictions 3. Like to count match scores 4. Love math symbols to solve problems	4
2. Language	1. Likes to argue 2. Like to write 3. Like crossword puzzles or guessing words 4. Like reading poetry or verse	4
3. Music	1. Quickly memorize songs 2. Like playing music 3. Likes to move to the rhythm of the music 4. Like listening to various types of music	4
4. Kinesthetic	1. Like sports 2. Love to dance 3. Like cooking/baking 4. Love sewing	4
5. Spatial	1. Like decorating the room 2. Likes to Study patterns or shapes 3. Like reading maps 4. Likes assembling toys	4
6. Interpersonal	1. Like chatting or discussing 2. Like helping or entertaining friends 3. Likes organizing, for example, likes joining OSIS 4. Like working in groups	4
7. Intrapersonal	1. Likes to make posts about yourself 2. Likes to understand his own feelings and moods 3. Like organizing personal time 4. Likes to set personal goals	4
8. Naturalist	1. Love Gardening 2. Likes keeping animals 3. Likes discussing environmental issues 4. Like environmental saving activities	4
9. Existential	1. Likes to think about life and the future. 2. Likes to Study Religion 3. Demonstrate curiosity and appreciation for different cultures and religions 4. Likes to ask about existing values and beliefs	4

Source: (McKenzie , 2005)The DMIS application has been developed, which can be accessed at the link https://smpn4singaraja.dmis.my.id/

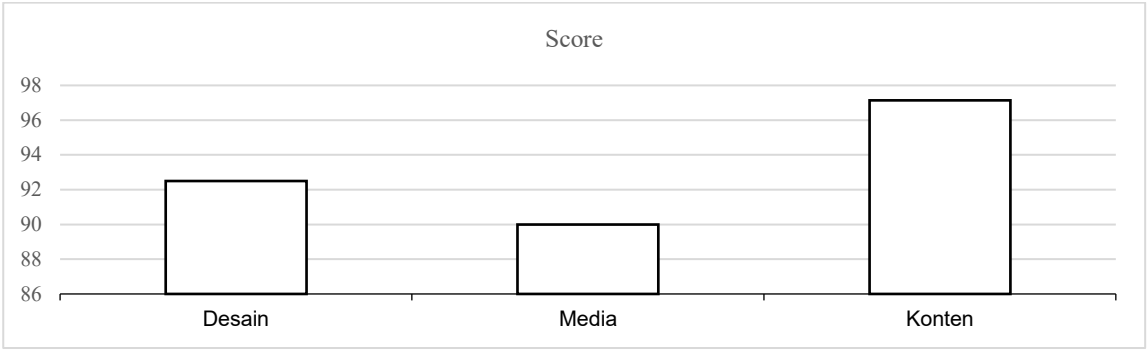
THE DMIS AMPLATION DISPLAY IS PRESENTED IN FIGURE 2 AND FIGURE 3.

FIGURE 2. DMIS FRONT PAGE VIEW

FIGURE 3. DMIS MENU PAGE VIEW

2. How is the validity of DMIS based on Ubiquitous learning?

The DMIS validity test involved 3 experts, namely learning design experts, media experts, and content experts. The test results are as follows.



Picture 4. DMIS Validity Test

Based on the data above, the validity of the Learning Design aspect, media aspect, and learning content aspect shows that DMIS obtained a very good category. Design experts provide input so that each activity or activity in DMIS provides instructions. Media experts provide input so that media is classified based on the type of intelligence, while content experts provide input so that each piece of content is adjusted to the learning objectives to be achieved.

3. How practical of DMIS based on Ubiquitous learning?

The Practicality Test currently involves 12 students. The practicality test was conducted at SMP Negeri 4 Singaraja. Figure 5 shows the documentation of the practicality test activities conducted at the Computer Lab of SMP Negeri 4 Singaraja. The results of the practicality test on junior high school students are presented in Figure 6.

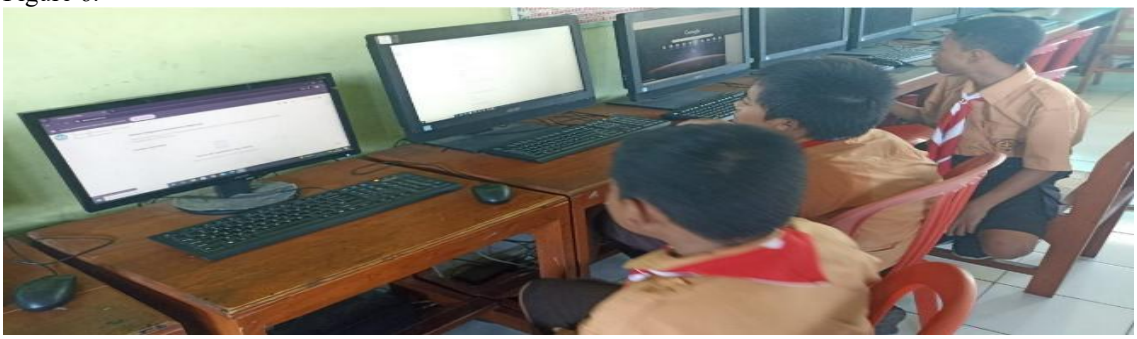


FIGURE 5. DMIS PRACTICALITY TEST ON 12 MIDDLE SCHOOL STUDENTS

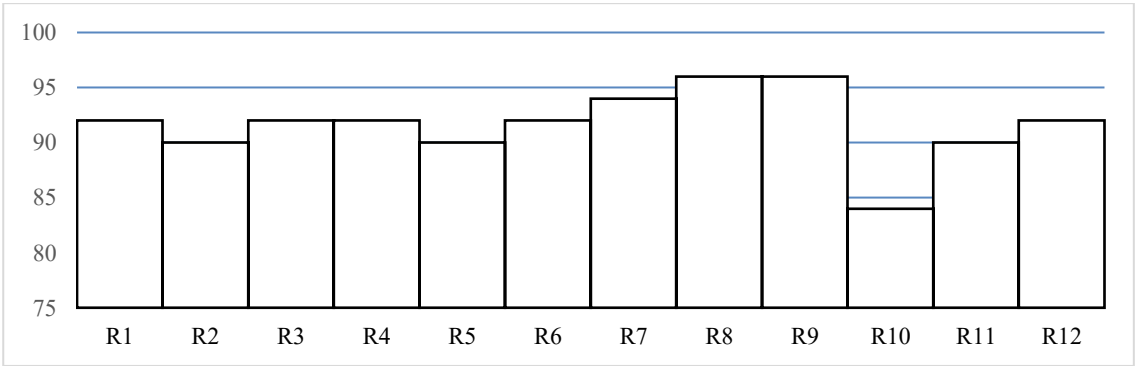


Figure 6. Distribution of Practicality Test Scores

Based on the practicality test on students, the average score was 91.7 (very good category). The students provided input so that the application is responsive, and the button functions should be explained.

4. How effective is digital content differentiation in DMIS applications?
differentiated digital content adopts a Multiple Approach Intelligence. This content provides an opportunity for each student to develop according to their talents, build self-confidence, and encourage active participation in the learning process. In the Figure 7 is its application in the classroom.

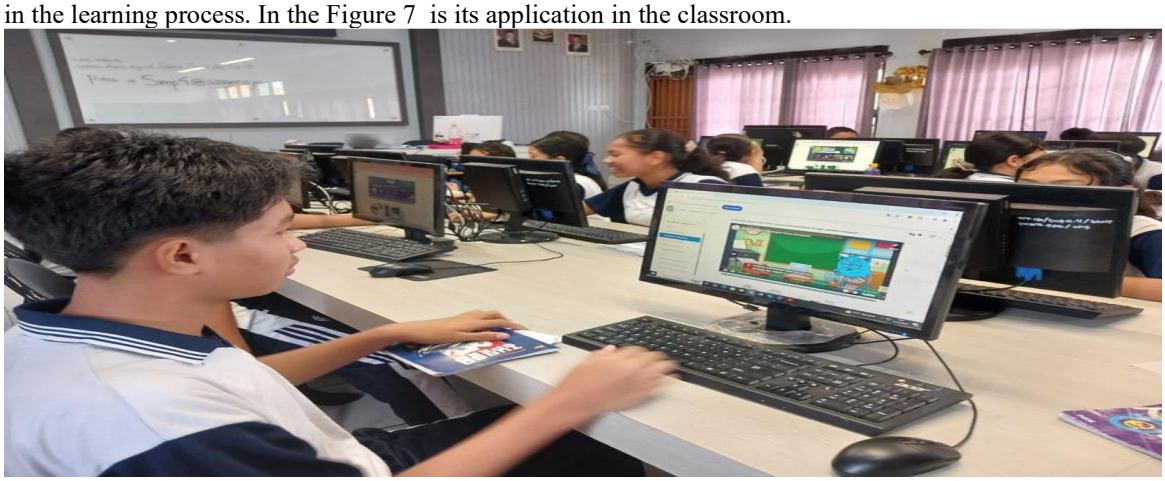


FIGURE 7. STUDENTS OPEN VIRTUAL LEARNING SPACE ON THE DMIS APPLICATION

The essence of implementing digital content is to realize differentiated learning . Differentiated learning is an approach that adjusts the process, content, and learning products according to the needs, interests, and Intelligence of students. Based on the test results between before and after implementing differentiated digital content on the DMIS application, it is presented in the Table 6.
Table 6. Data Distribution Normality Test

	Kolmogorov-Smirnov (a)			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig .
Pretest	0.144	32	0.088	0.945	32	0.103
Posttest	0.146	32	0.080	0.938	32	0.066

a Lilliefors Significance Correction
normality test in the table above, in the Kolmogorov-Smirnov(a) column, it shows that: (1) the pretest score data obtained a sig of 0.088, which is greater than the set significance level of 0.05, so the pretest score normally distributed. (2) the posttest score data obtained a sig of 0.080, which is greater than the set significance level of 0.05, so the pretest score is normally distributed . Furthermore, the homogeneity of the data variance obtained is presented in the following Table 7.

TABLE 7. HOMOGENEITY OF VARIANCE TEST

Dependent Variable	Testing	Levene Statistics	df1	df2	Sig .
Learning outcomes	Based on Mean	0.974	1	62	0.328
	Based on Median	1,127	1	62	0.292
	Based on the Median and with adjusted df	1,127	1	60.71	0.293
	Based on trimmed mean	1,031	1	62	0.314

Based on Mean test show that for Sig = 0.328. If the significance level is set at 0.05, then the Sig obtained is 0.328 which is more significant than 0.05. Thus, the learning outcome data has a homogeneous variance. The description of the pretest and posttest data is presented in the following Table 8.
Table 8. Description of Pretest and Posttest Data

		Mean	N	Std . Deviation	Std . Error Mean
Pair 1	Pretest	70.62	32	17.21	3.04
	Posttest	78.12	32	14.24	2.51

Based on the table above, the average pretest score is 70.62 and the average posttest score is 78.12. This shows that there is an increase between before and after the DMIS application is implemented.

TABLE 9. PAIRED SAMPLES T-TEST

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-7.5	10.16	1.79	-11.16	-3.83	-4.17	31	0,000

Based on the output in the table above, it is known that Sig (2-tailed) has a value of 0.000. Because the value of 0.000 is smaller than 0.05, Ha is accepted and H0 is rejected. This means that there is a significant difference in learning outcomes between before participating in learning by implementing the DMIS application and after participating in learning by implementing DMIS. It can be concluded that digital content based on multiple intelligences has an influence on learning outcomes in Informatics subjects.

DISCUSSION

Validity tests from experts show that DMIS based on Ubiquitous learning obtained a very good category in the aspects of learning design, media, and learning content. DMIS learning design can be stated as very good because it has fulfilled various important aspects that enable students to learn effectively and comprehensively. DMIS learning design has been designed to support learning objectives, learning strategies, and learning (Patricia L. Smith & Tillman J. Ragan, 1993)assessments .

Good learning design begins with clear and specific learning objectives. This means that what the learner wants to achieve after taking the lesson has been determined in advance. With clear objectives, every component of learning, from content to evaluation methods, will be aligned to achieve these objectives. DMIS learning design has accommodated various learning styles and student intelligence. Not all students learn in the same way, and learning design must be flexible and inclusive. The use of various media such as text, audio, video, simulations, and physical activities allows students with various learning styles to get optimal benefits. DMIS learning design includes comprehensive evaluation aspects, both in the form of formative evaluation (to provide feedback during the learning process) and summative evaluation (to assess the final results). Evaluation has also been assessed as relevant to learning objectives and able to assess various aspects of student understanding.

The validity of the media and interface aspects obtained a very good category. The media aspect in DMIS greatly supports the learning process, is relevant to the material, and is able to accommodate various types of student intelligence. The media used in DMIS directly (Mayer, 2009, 2021; Mayer & Moreno, 2003)supports learning objectives . This media is not only an additional tool, but plays an important role in helping students achieve the learning outcomes that have been set. Examples of use. Animated videos to explain complex scientific processes or digital simulations to understand the laws of physics. Media is able to visualize abstract materials. Media that is increasingly visual is better than media that contains only text . Visualization can help students understand concepts more clearly and effectively, as well as increase student retention and engagement. Visualization allows the presentation of complex and abstract concepts to be more easily understood. Many concepts that are difficult to explain with words alone can be better explained through images, diagrams, graphs, or videos. DMIS contains a variety of media to accommodate the various learning styles and intelligences of students. Various media such as videos, audio recordings, interactive materials, or practical projects ensure that each student can learn according to their own style. Likewise, regarding the variety of student intelligences, according to Howard Gardner's theory of multiple intelligences, each student has different intelligences, such as linguistic, logical-mathematical, spatial, kinesthetic, musical, interpersonal, intrapersonal, and naturalist intelligence. The use of various media makes it possible to touch these various intelligences so that more students can be actively and deeply involved. The DMIS interface is also assessed in the media aspect. The DMIS interface has met important criteria in creating a positive user experience (UX). The DMIS interface design makes it easier for users to interact with the application but also makes the use of the application feel intuitive, comfortable, and efficient.

The content aspect of DMIS, specifically in the learning space, has met the valid aspect. The content aspect or content of DMIS learning has met a number of criteria that ensure that the material is relevant, accurate, and in accordance with learning objectives. Content validity plays an important role in creating a practical and meaningful learning experience for students. Learning content is considered appropriate and relevant to the learning objectives that have been set. Each material presented must be directly related to the competencies or

learning outcomes that students want to achieve. Learning content is also considered complete and covers all aspects needed to achieve a full understanding of the topic being studied.
Based on the practicality test, DMIS has very good practicality. DMIS is said to be practical because it provides convenience to students. First, DMIS accessibility can be anywhere and anytime. DMIS can be accessed via devices such as smartphones, tablets, or laptops. This allows students to study anywhere and anytime without being tied to a schedule or physical location, so it is very flexible. Second, it requires efficient time. Students can use their free time productively to study during break times. This gives students the opportunity to use their time efficiently. Third, DMIS provides digital materials through various media such as audio, video, animation, and simulations that accommodate students' diverse Intelligence. Various learning media are very important to support various types of student intelligence, as explained in Howard Gardner's Multiple Intelligences theory. Each student has a different learning style and Intelligence, so a single-method approach will not be effective for all (Gardner, 2018). Each student has different Intelligence and learning style. Some students learn better through visuals (pictures, graphics), while others learn better through audio (listening), kinesthetic (direct practice), or reading/writing. Various media in DMIS allow educators to accommodate all learning styles. Fourth, DMIS adopts Personalized Learning. DMIS is designed to adjust the material to the abilities, learning speed, and needs of the user. This allows for more focused and relevant learning for each individual. Personalization is one of the principles in multimedia that has a positive impact on the student learning process (Rey & Steib, 2013). Fifth, DMIS has interactive features and direct feedback. DMIS not only diagnoses student intelligence but also provides a virtual learning space that contains various media and learning activities. Interactive features such as quizzes, simulations, and educational games make learning more interesting. In addition, direct feedback can be given after users complete exercises or tests, which helps improve their understanding in real time. This finding is in line with the results of other studies stating that interactive features and feedback have a positive impact on the student learning process (Belawati et al., 2020; Lim et al., 2020; Redifer et al., 2021). Sixth, the DMIS application can monitor and manage student progress. DMIS is equipped with features that allow users to track student progress. Students can view learning statistics and set learning goals so that students can be more motivated and structured in achieving the targets set.

Digital content tailored to different intelligences allows students to learn in the most effective way. For example, interactive videos and animations for visual-spatial Intelligence. Simulations or virtual experiments for logical-mathematical Intelligence. Songs or rhythms for musical Intelligence. Online group discussions for interpersonal Intelligence. Differentiation of content can make it easier for students to learn the subject matter (Gani, 2017; Hajhashemi, 2018).
When students feel that learning is in accordance with their interests and talents, their motivation to learn will increase. Students feel appreciated because their learning methods are accommodated through the DMIS application, which helps students recognize their own Intelligence and provides varied learning content. This differentiation will make students more optimal and easier to learn (Setiawan, 2020)

CONCLUSION

Based on expert tests, the developed DMIS was declared valid in terms of design, media, and content with a very good category. The practicality of DMIS was also considered very good by students. This means that the design and development of DMIS to facilitate students in learning according to their intelligence type has met the elements of learning, content, and ease of use. Digital content based on multiple intelligences available in the DMIS application in optimizing student learning outcomes. Students feel more accommodated in learning with the facilities of interesting digital content. The limitation in this study is that testing was only carried out on one class. For this reason, further testing is needed with more classes.

AUTHOR CONTRIBUTIONS

Sudarma , IK contributed in designing DMIS, conducting testing, and Data analysis. Aditya, IP, contributed to data analysis. Ariana, AAGB contributed in developing DMIS system. Prabawa, DGAP contributed in testing validity and practicality of DMIS. All teams were involved and contributed in writing the article.

FUNDING

This research was funded by the Directorate of Research, Technology, and Community Service of the Ministry of Education, Culture, Research, and Technology in 2024. Decree number 0459/E5/PG.02.00/2024 and contract agreement number 083/E5/PG.02.00.PL/2024.

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