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Analysis of Elementary School Students' Learning Readiness in the Implementation of Differentiated Learning

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Abstract. This study analyzes the learning readiness of elementary school students in implementing differentiated learning, on grade IV-VI students in Cluster 1 Puntadewa, Serengan District, Surakarta City. Differentiated learning involves modifying content, processes, and products according to student's readiness, interests, and learning profiles. This study uses a descriptive quantitative approach with data obtained through a learning readiness scale. The population in this study consists of students in grades IV–VI from elementary schools in the Puntadewa 1 Cluster, Serengan District, Surakarta City, for the 2023/2024 academic year. The sampling technique used was cluster random sampling, which included two schools: SD Negeri Kartodipuran and SD Muhammadiyah 14. The learning readiness scale in this study consisted of 40 statement items covering four aspects of learning readiness: (1) physical readiness, (2) psychological readiness, (3) material readiness, and (4) attitude and knowledge. The results showed that students had varying levels of learning readiness, which were divided into three categories: high, medium, and low. Differentiated learning helps students with high learning readiness achieve better results than those with medium and low learning readiness. The implications of this study support the use of differentiated learning strategies to improve the effectiveness and inclusiveness of learning.

Keywords: Learning Readiness; Content Differentiation; Process Differentiation; Product Differentiation; Elementary School.

1. Introduction

As the implementation of 21st-century learning in the context of contemporary education continues to evolve, there is a growing awareness of the importance of a learning approach that is responsive to the individual needs of learners. One crucial aspect of this individualization is the adjustment of learning to the characteristics of learners. (Lindner & Schwab, 2020) . In this context, personalized and differentiated learning becomes increasingly relevant to ensure that every learner can access education according to their needs and potential (Gheyssens et al., 2022).

Taş & Minaz, (2024) emphasize the importance of a differentiated approach to learning, where materials, teaching methods, and evaluations are tailored to the needs of each learner. Bondie et al., (2019) differentiated learning, defined as "an instructional approach that proactively modifies teaching methods, learning resources, learning activities, and student assessments to meet individual learner needs", is increasingly recognized as an important strategy in creating an inclusive and effective learning environment. Differentiated learning is implemented by the concept of differentiation, namely that teachers must pay attention to the readiness, interests, and learning styles or profiles of students in learning (Aguhayon et al., 2023; Vijayan & Mohamad Nasri, 2022).

The implementation of differentiated learning is by the concept of the new curriculum currently being implemented in the Indonesian education system, namely the independent curriculum. Differentiated learning in the independent curriculum provides flexibility for educators to formulate learning and assessment designs according to the characteristics and needs of their students (Gusteti & Neviyarni, 2022). Teachers need to provide different treatments to students,

at least in the content of the material to be studied, the process of obtaining the material, and the products used as learning evaluation tools in differentiated learning in elementary schools (Langelaan et al., 2024). Differentiated learning has 3 aspects that are used as teaching elements, namely: (1) content differentiation, namely differentiated learning related to the curriculum and the content of the material in learning; (2) process differentiation, namely differentiation in the process of interaction with students; (3) product differentiation, namely differentiation in student learning outcomes (Geletua & Mihirete, 2022; Papanthymou & Darra, 2022).

1.1. Problem Statement

The main problem of this research is how the readiness of students to learn can be accommodated through differentiated learning. Readiness to learn includes physical, psychological, and material aspects, as well as attitudes and knowledge that vary among students (Yulianto et al., 2022). Unpreparedness to learn can cause gaps in the learning process, so some students may be left behind or feel less confident (Abdelshiheed et al., 2021). Based on an interview with a fifth-grade elementary school teacher in cluster 1 Puntadewa, Serengan District, differences in abilities, learning experiences, and levels of cognitive and emotional development of students were identified. This can be a challenge for teachers in adjusting teaching approaches, especially in heterogeneous classes. As a result, students who do not receive the appropriate approach may have difficulty understanding the material or lose motivation to learn.

It is important to carry out an in-depth analysis of students ' learning readiness. (Martin et al., 2020) , including identifying the level of students ' learning readiness and how differentiated learning can be implemented effectively. Data collection through a learning readiness scale instrument which is then carried out by observation. Towards students and teachers in the learning process can provide a deeper understanding of the challenges and successes in implementing differentiated learning.

This research provides an understanding of learner readiness to learn and how differentiated learning can be applied will help create teaching strategies that are more effective, inclusive, and responsive to the needs of all learners. This will have a positive impact on students' academic achievement and personal development, especially in supporting those who require different learning approaches.

1.2. Related Research

The first study relevant to this research topic is a study by Wong et al. (2023). The results of the study showed an increase in intrinsic motivation and perceived competence by students in classes that implemented differentiated learning. These findings confirm the effectiveness of implementing differentiated learning strategies based on learning readiness in increasing intrinsic motivation and perceived competence by students. The second study relevant to this research topic is a study by Özüdoğru (2022). The study was conducted with research participants being students at a Turkish university. The findings revealed that online differentiated learning has a significant impact on the academic achievement of prospective teachers. The third study relevant to this research topic is a study by Taş & Minaz (2024). The study used a quasi-experimental model with a pretest and posttest design. This study shows that classes that implement differentiated learning allow students to participate actively, facilitate classroom management, and create a fun and planned learning atmosphere, where individual differences and learning readiness are highly valued. The fourth study relevant to this research topic is a study by Gheyssens et al. (2022). The results of this study reveal that a teacher needs to apply differentiated learning by adjusting the interests, readiness, or learning profiles of students. Classes that apply differentiated learning will create more inclusive learning. The fifth study relevant to this research topic is a study by Smets et al. (2022). The results of this study state that the success of the learning process is not only influenced by students' readiness to learn but also by motivational traits such as self-regulation or self-efficacy.

Although previous studies have explored similar variables regarding differentiated learning, a comprehensive analysis of learning readiness has not been conducted. So this study is

important to analyze the learning readiness of grade V elementary school students in cluster 1 Puntadewa in implementing differentiated learning.

1.3 Research Objectives

The objectives of this study is to identify the level of learning readiness of elementary school students in implementing differentiated learning.

2. Theoretical Framework

2.1 Differentiated Learning

Each student has their characteristics in acquiring learning knowledge in class. Students have a uniqueness in processing learning, and teachers and parents have an important role in recognizing this uniqueness (Alannasir, 2020), even though students are in the same class, students need different treatment. The concept of differentiated learning needs to be applied and developed because it provides great opportunities for students to develop their potential (Gobiberia, 2021). Differentiated learning is a way for teachers to provide different treatment and attention to each student. Learning by providing the concept of differentiation makes it easier for teachers to find things that students like (Grecu, 2023). The concept of differentiated learning is that teachers are given the obligation to reflect on the uniqueness of students and present various activities in class (Geletua & Mihirete, 2022).

Teachers implement differentiated learning based on the theory that every student has the right to experience development. (Morgan, 2014) . The theoretical basis for differentiated learning has long been found. Differentiated learning is by the concept of educational theory for children by Maria Montessori. Montessori emphasizes learning that prioritizes freedom, freedom here is the freedom to carry out activities based on the characteristics of students so that students can develop according to their character (Barrameda, 2024). The suitability of differentiated learning with Montessori theory is supported by Utami, (2023) who said that each student has their characteristics or uniqueness when participating in the learning process, the role of teachers and other adults is to be a facilitator for students.

Several findings find that teachers still cannot interpret and apply differentiated learning, such as in the study (Witraguna et al., 2024) which states that there are still teachers who do not implement differentiated learning because if there are differences in treatment, teachers assume it will cause jealousy between students. Misunderstanding of the concept of differentiation by teachers must be eliminated so that teachers can develop the functions of differentiated learning (Putra, 2023). Differentiated learning is learning that requires differences in teaching methods and meets the needs of students because students have diverse characters (Ismajli & Imami-Morina, 2018). Differentiated learning is a teacher's effort to meet the needs of students based on their learning readiness, interests, characteristics, and learning profiles (Zulaikha & Laeli, 2023; Tomlinson, 2017). Furthermore (Made, 2022) conveyed that differentiated learning is a way for teachers to organize and implement a diverse learning process so that they can provide various learning activity options to students. This is done so that students can freely explore information, express their ideas, and demonstrate their ideas.

The application of differentiated learning has a positive effect on students, especially when students are grouped according to their learning styles, interests, and readiness to learn. (Smale-Jacobse et al., 2019). This statement is in line with the research results (Geel et al., 2022) which produce data that differentiated learning makes it easier for teachers to achieve learning objectives because students can complete learning with good results. Similar results were also presented by (Fajaryati et al., 2023) that the application of differentiated learning produces good learning outcomes for students.

There are 3 elements of differentiated learning according to Grecu, (2023); Tomlinson, (2017), namely content differentiation, process differentiation, and product differentiation. (1) Content differentiation, contains everything that students will learn related to the curriculum and teaching materials (Özüdoğru, 2022). Teachers need to master teaching materials according to the curriculum so that they can adjust the characteristics of their students. (2) Process

differentiation, which refers to the process of understanding information in learning. Process differentiation contains how teachers and students achieve learning goals (Gusteti & Neviyarni, 2022). (3) Product differentiation, which is the work of students and reflects how students understand the content and processes that have been passed (Melesse & Belay, 2022).

Based on the explanation of several expert opinions above, the synthesis of differentiated learning is a learning concept that has a positive impact on several parties, especially students. Differentiated learning encourages teachers to organize interactive strategies that are by the readiness, interests, and learning profiles of students. Things that support the success of the implementation of differentiated learning are that teachers need to pay attention to the readiness, abilities, interests, and learning styles of each student. The implementation of differentiated learning is carried out based on content differentiation, process differentiation, and product differentiation. This study focuses on the differentiation of learning readiness *of* students who have different levels.

2.2 Readiness to Learn

Student learning readiness is an important aspect that must be considered by teachers before starting the learning process. Learning readiness is a condition of students that allows them to respond or provide a response to the learning process (Hidayat et al., 2024). Students who have good learning readiness tend to follow learning better than others. This is due to their ability to more easily deepen learning materials and maintain concentration during the learning process (Tomlinson, 2017). In line with this opinion, Magableh & Abdullah (2020) stated that good learning readiness from students can provide good output.

The learning readiness of one individual with another individual in the learning process has different levels. The level or degree of learning readiness of students can be influenced by the readiness of schools and teachers in preparing learning (Werfhorst et al., 2022) . The theory of learning readiness is by the law of readiness proposed by Thorndike. Thorndike's Law of Readiness states that effective learning occurs when individuals are physically and mentally ready, so this readiness is an important prerequisite in the learning process (Chisunum & Nwadiokwu, 2022). Based on the law of readiness, ready students will feel satisfied when doing work, and conversely, forcing students who are not ready will cause dissatisfaction in carrying out a job (Şaban & Atay, 2023). Lev Vygotsky's learning theory also has a relationship with learning readiness. (Vygotsky, 2019) states that students' learning readiness is determined by their actual and potential developmental levels or zone of proximal development (ZPD). Teachers must understand the development of their students so that they can provide scaffolding that is by their learning readiness. Scaffolding is assistance provided by teachers or educators to students to help them achieve maximum development potential (Margolis, 2020).

Yulianto et al., (2022) Learning readiness is defined as the condition of students to receive understanding, knowledge, and skills in learning activities. Learning readiness can be done by doing physical and psychological preparation, this includes preparation of maturity to do something, mastery of knowledge, and basic skills. Good student learning readiness can provide benefits and learning experiences so that it can improve student abilities (Gheyssens et al., 2022). A research study conducted (Martin et al., 2020) emphasizes the importance of learning readiness in optimizing the learning process. Factors that influence students' learning readiness can be categorized into two main groups: internal and external. This classification provides a framework for understanding and managing the variables that play a role in students' learning readiness. Internal factors include physical (health), cognitive (intelligence and talent), and affective (interest and motivation) aspects. External factors include family, school, community, and the surrounding environment (Ellefson et al., 2020).

Based on several expert opinions regarding students' learning readiness, a synthesis of the literature on learning readiness indicates that this concept refers to the condition of students when they will receive learning provided by the teacher. Students' learning readiness is influenced by internal and external factors. The level of learning readiness correlates significantly with the effectiveness of the learning process. Students with optimal learning readiness tend to show active participation and achieve better learning outcomes.

3. Method

3.1. Research Design

This study uses a descriptive quantitative approach to analyze and describe the level of learning readiness of elementary school students in the context of implementing differentiated learning. Acording to Cresswell (2024) quantitative research is the process used to collect and analyze numerical data in order to characterize, explain, predict, or govern the variables and phenomena of interest. Employing a Likert-type scale questionnaire (1–5) to collect data systematically. This design was chosen for its ability to address both descriptive and variable-based research questions while ensuring data rigor (Hernández & Maquilón, 2010). Commonly used in educational research, survey designs are versatile for exploring various problems and gathering data on multiple variables (Sapsford & Jupp, 2006).

3.2. Participants

The study was conducted on a population of upper-grade (grades IV-VI) students in cluster 1 Puntadewa, Serengan District, Surakarta City in the 2023/2024 Academic Year. Upper elementary school students (grades IV–VI) possess distinct characteristics in terms of cognitive, physical, and emotional development. According to Piaget's theory, they are in the concrete operational stage, transitioning to the early formal operational stage, where logical and abstract thinking begins to develop, although they still require concrete experiences for full comprehension. Physically, they are in the late childhood phase approaching puberty, characterized by increases in height, muscle strength, and improved motor coordination. They also exhibit high energy levels, enabling active participation in various activities. The sample of this study was 135 students with students from SD Muhammadiyah Danukusuman and students from SD Negeri Kartodipuran. The school represents the elementary school cluster in the Puntadewa cluster, Serengan District in terms of accreditation, so it is hoped that the results of the study can represent the research population in the Puntadewa Cluster, Serengan District, Surakarta City. In addition, the classes used in this study have implemented differentiated learning based on learning readiness by the independent curriculum.

3.3. Data Collection

Data collection was used by researchers in this study using a scale of learning readiness and observation of the implementation of the learning process. The scale is an instrument used in studies or research with a quantitative approach (Sugiyono, 2019). The scale functions to convert the research variables being studied into numerical data. This study uses a scale to measure the level of learning readiness of students so that students can be categorized based on their level of learning readiness. This study uses a Likert scale consisting of two types of items, namely positive (favorable) and negative (unfavorable) items. The scale of learning readiness in this study consists of 32 statement items containing 4 aspects of learning readiness, namely (1) physical readiness, (2) psychological readiness, (3) material readiness, and (4) attitude and knowledge. The following is a grid of the learning readiness scale which can be seen in Table 1.

Table 1. Grid of Student Learning Readiness Scale

Aspect	Indicator	Statement	Number of grains
Physical readiness	Physical ability is related to daily stamina.	(+) I can participate in all activities at school without feeling tired. (+) I can see the pictures/videos shown by the teacher clearly. (-) I feel tired when I do more than 3 activities at school. (-) I have difficulty seeing clearly and distinguishing colors in pictures/videos.	4

Aspect	Indicator	Statement	Number of grains
	Prepare yourself before taking the lesson.	(+) I take care of my health by eating breakfast or a small snack before going to school. (-) I get tired easily when taking lessons.	2
	Get enough sleep.	(+) I get enough sleep every day. (+) I attended the lesson in a fresh condition. (-) I started to feel sleepy during the lesson.	4
Psychological readiness	Have high participation.	(+) I dare to ask if I am still confused about the lesson material. (+) I dare to give a different opinion to my friends. (-) I feel annoyed when my friends ask questions during class.	3
	Ability to manage emotions.	(+) I try to stay calm when facing problems at school. (-) I get angry/offended easily when facing problems. (-) I feel sad if I get a low score.	3
	Self-confidence.	(+) I completed the task with my abilities. (-) I looked at my friend's answer because I was unsure about my answer.	2
Material readiness	Availability of learning tools.	(+) I study the material before it is discussed in class. (+) I have all the necessary textbooks. (-) I borrow textbooks, worksheets, notebooks, or other stationery from friends.	3
	A conducive learning environment.	(+) I have a quiet and comfortable study room. (-) My study room is connected to another room, noisy and uncomfortable.	2
	Ability to access learning resources.	(+) I look for study materials from books or other sources if something is not clear. (-) I only study from textbooks and class notes.	2
Knowledge and attitudes	Enthusiastic attitude in participating in learning.	(+) I focus on paying attention to the teacher when explaining the lesson material. (+) I noted down the important points conveyed by the teacher. (-) I felt bored during the lesson.	3
	Desire to gain a lot of experience.	(+) I like discussing and exchanging opinions with friends. (-) I feel disappointed when my ideas don't get a good reaction.	2
	Trying to get the best results.	(+) I try to get high marks by practicing the questions. (+) I always study whether there is a test or not. (-) I ignore studying even though there is an exam tomorrow.	3
Total statement items			32

Each statement on the student learning readiness scale has the following assessment guidelines.

Table 2. Guidelines for Assessing Student Learning Readiness Scale Scores

Statement	Score				
	Always	Often	Sometimes	Seldom	Never
Favorable	5	4	3	2	1
Unfavorable	1	2	3	4	5

3.4. Data Analysis

This study employed a quantitative data analysis method with a descriptive approach, guided by the postpositivist paradigm. This paradigm emphasizes cause-and-effect exploration, variable reduction, hypothesis testing, and data measurement through strategies such as experiments and surveys requiring statistical analysis (Emriz, 2008). The results were scored and categorized based on specific criteria (See Table 3).

Table 3. Category of Score Range

Score Range	Category	Range of values
X > (Mean + Sd)	Tall	X > 80
(Mean+SD) ≥	Currently	80 ≥ X > 55
X ≤ (Mean – Sd)	Low	X ≤ 55

3.5. Validity and Reliability

3.5.1. Validity Test

The learning readiness scale is used to categorize the level of learning readiness of students. The scale used to test the learning readiness of students in this study consisted of 32 items. The validity of this scale instrument has been tested by 2 expert judges, where in this study the expert judges who validated the instrument were 2 experts in the field of psychology and were lecturers at Sebelas Maret University, and obtained results that all statement items were declared valid.

Next, validity is carried out using the SmartPLS 4 Application. This stage aims to verify the suitability of the research variables. This process involves testing the relationship between variables using the Partial Least Square-Structural Equation Modeling (PLS-SEM) method. The following are the results of the convergent validity test by assessing based on the graphical output image that presents the outer loadings value (See Figure 1).

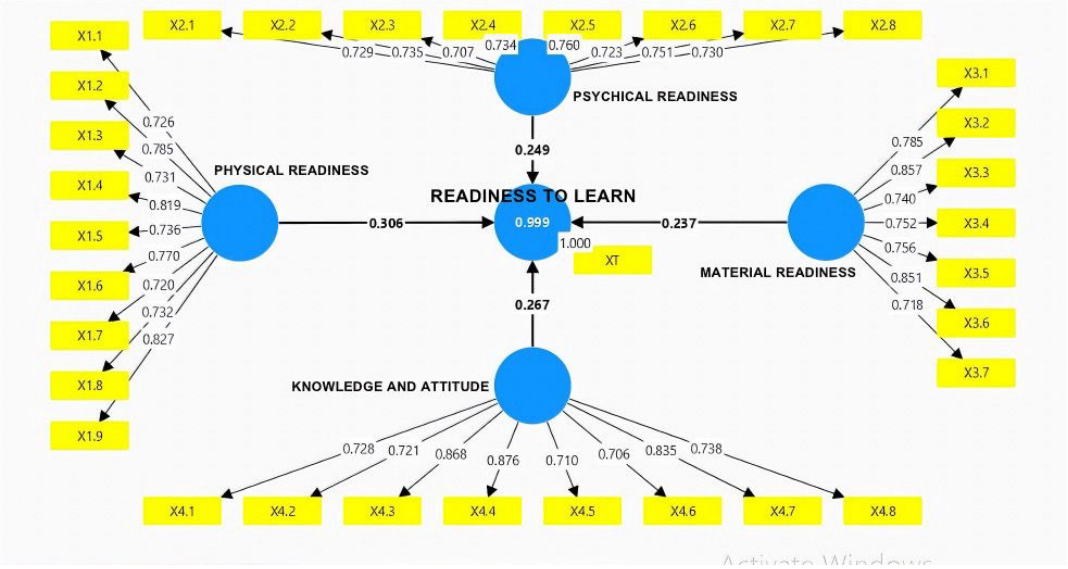

Figure 1. Results of the Validity Test of the Learning Readiness Scale

The statement items on each indicator can be declared valid if the outer loading value is > 0.7 or the Average Variance Extracted (AVE) value is > 0.5 (Anggraeni & Laily, 2023). Based on the results of the validity test in Figure 1, all statement items on the learning readiness scale are declared valid because they have outer loading values on each indicator of > 0.7.

3.5.2 Reliability Test

Reliability testing on the student learning readiness scale instrument is carried out based on the reliability construct. This can be shown by using the reliability criteria shown in the following Table 4.

Table 4. Results of the Reliability Test of the Student Learning Readiness Scale

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Physical Readiness	0.909	0.912	0.925	0.580
Material Readiness	0.893	0.902	0.916	0.611
Psychological Readiness	0.877	0.878	0.903	0.538
Knowledge and Attitude	0.904	0.909	0.923	0.602

A construct can be said to be reliable if it meets two main criteria. First, the Composite Reliability (rho_c) value must exceed 0.7, which indicates that the indicators in the construct have good internal consistency. Second, the Cronbach's Alpha value must also be greater than 0.7. Based on the results of the reliability test on construct reliability, the physical readiness aspect has a croncah's alpha value of 0.909 and a rho_c of 0.925; the material readiness aspect has a croncah's alpha value of 0.893 and a rho_c of 0.916; the psychological readiness aspect has a croncah's alpha value of 0.877 and a rho_c of 0.903; the knowledge and attitude aspect has a Cronbach's alpha value of 0.904 and a rho_c of 0.923. These four aspects also have an AVE value greater than 0.5, so that the scale of students' learning readiness consisting of 32 statement items can be declared valid and reliable.

4. Findings

Identification of the level of learning readiness of grade V elementary school students in Cluster 1 Puntadewa, presented as follows.

Table 5. Results of Descriptive Statistical Analysis of Students' Learning Readiness

	N	Range	Minimum	Maximum	Mean	Std.Deviation
Learning Readiness Data	135	41	46	87	67,171	12,675

Table 5 shows the results of filling in the learning readiness scale by 135 students in cluster 1 Puntadewa with an average value of 67.171; a maximum value of 87; a minimum value of r 46; with a standard deviation of 16.675. The data is processed into frequency distribution data for student learning readiness which can be seen in Table 6, to find out the differences in class intervals in more detail.

Table 6. Frequency Distribution of Students' Learning Readiness

Interval	Class Length	Frequency	Presentation
1	46 – 53	19	14%
2	54 – 61	31	23%
3	62 – 69	18	14%
4	70 – 77	29	17%
5	78 – 85	35	26%
6	86 – 93	8	6%
Amount		135	100%

The data obtained on students' learning readiness were analyzed into 3 categories, namely high learning readiness, medium learning readiness, and low learning readiness. The following Table 7 is the distribution of students' learning readiness levels.

Table 7. Distribution of Students' Learning Readiness Levels

Score Range	Category	Range of values	Kartodipuran Elementary School	SD Muh 14
X > (Mean + Sd)	Tall	X > 80	25	26
(Mean+SD) ≥	Currently	80 ≥ X > 55	26	26
X ≤ (Mean – Sd)	Low	X ≤ 55	15	17

The analysis of the distribution of learning readiness categories in grade V at SD Negeri Kartodipuran produced the following data: from a total of 66 research samples, 25 individuals were identified who demonstrated a high level of learning readiness, 26 individuals with a moderate level of learning readiness, and 15 individuals who were classified in the low learning readiness category. The results of the analysis of the distribution of learning readiness categories in grade V at SD Muhammadiyah 14 Danukusuman showed the following pattern: from a total of 69 research samples, 26 individuals were identified who demonstrated a high level of learning readiness, 26 individuals with a moderate level of learning readiness, and 17 individuals who were classified in the low learning readiness category.

5.Discussion

5.1. Analysis of the Level of Student Learning Readiness in the Application of Differentiated Learning

The level or level of learning readiness of students that have been categorized is then implemented in the learning process with the concept of differentiation. Students with a high category carry out differentiation learning by completing assignments independently. Students with a medium category carry out assignments with teacher assistance if needed, while students with a low learning readiness category complete assignments with full teacher assistance. This is by the Zone of Proximal Development (ZPD) theory (Zaretsky, 2021). Teachers have the task of understanding the development of their students so that they can provide scaffolding that is by their learning readiness. *Scaffolding* is assistance provided by teachers or educators to students to help achieve maximum development potential (Margolis, 2020). The following is an analysis of learning readiness in the application of differentiation learning elements:

5.2. Readiness to Learn in Content Differentiation

Greco (2023) explained that content differentiation is carried out because it is not possible to provide the same material or to equate material to all students, even though students have different learning readiness. Differentiation of content based on learning readiness refers to the adjustment of learning materials according to the level of understanding and ability of each student (Tomlinson, 2017). The differentiation of content implemented based on the learning readiness of students at SD Cluster 1 Puntadewa allows teachers to present content with varying levels of complexity, ensuring that each student gets challenges that match their abilities.

Learning readiness analysis involves continuous assessment of students' knowledge, skills, and understanding related to the subject matter being taught. This allows teachers to identify gaps between what students already know and what they need to learn (Fajaryati et al., 2023). The implementation of content differentiation based on learning readiness in elementary schools in cluster 1 Puntadewa has involved several strategies. For example, teachers prepare the use of reading materials with varying levels of difficulty and provide a variety of learning resources (videos, PowerPoint, reading texts). In the science learning of the solar system material, researchers found fact that grade V teachers in elementary schools in cluster 1 Puntadewa had implemented learning content differentiation. Teachers provide differences in teaching materials used for students with high, medium, and low learning readiness categories. The implementation of content differentiation that has been applied by teachers not only improves students' understanding of the material but also encourages their motivation and involvement in the learning process.

5.3. Readiness to Learn in Process Differentiation

Process differentiation is carried out by implementing a learning process that is adjusted based on the learning readiness of students. The process differentiation applied by grade V elementary school teachers in cluster 1 Puntadewa is implemented in the form of differences in learning media used, instructions, and group Work Sheet that are adjusted based on the learning readiness of students. This is in line with the differentiation learning theory by Tomlinson (2017), process differentiation includes all student activities related to instructions from the teacher, textbooks used, and learning media.

The implementation of process differentiation in elementary schools in cluster 1 Puntadewa emphasizes the importance of adjusting the way students learn based on their readiness so that each student can learn most effectively according to their level of understanding and ability. The results of the researcher's observations on the implementation of process differentiation obtained the fact that students with high learning readiness can follow the learning process more actively compared to other students. Students with medium and low learning readiness categories tend to have increased activity than usual, although still below students with high learning readiness categories.

Based on observations on differentiated learning in grade V of elementary school in cluster 1 Puntadewa, it has been implemented by providing varied instructions, such as the use of visual materials, project-making activities, and game-based learning to help students who need a different approach in understanding the concept of the material. In addition, Marlina et al. (2019) emphasized that process differentiation requires teacher skills in observing and understanding students' learning readiness to provide the right learning experience. Grade V teachers of elementary school in cluster 1 Puntadewa have conducted routine observations and formative assessments to assess students' readiness so that teachers can adjust the selection of learning strategies effectively.

5.4. Readiness to Learn in Product Differentiation

Product differentiation is the difference in assignments to make products based on the category of learning readiness level. Assignments carried out in product differentiation are also valuable experiences that make students understand the material better and can improve critical reasoning skills because, in the product-making process, students learn concretely and learn based on experience (Potot et al., 2023).

The implementation of product differentiation in learning in grade V of elementary school in cluster 1 Puntadewa is carried out by paying attention to the learning readiness of students, which allows them to demonstrate understanding and skills in different ways according to their characteristics. Teachers who understand the concept of differentiation implement differentiation in the assignment of making a product to students. Teachers provide flexibility to students to determine strategies for completing their products. In the science learning of the solar system material, researchers found the application of product differentiation, namely the teacher gave assignments to students with a high learning readiness category to make a miniature solar system. In making it, students with high learning readiness are given the challenge of making more complex products, analyzing what is needed, and completing it independently. Students with a medium learning readiness category are given the assignment of making a digital poster. Students with a medium category have been given instructions to prepare the tools and materials needed, and the teacher helps students when students find it difficult to complete the product. Meanwhile, students with a low learning readiness category are given the assignment to make a poster product containing the solar system material. The teacher has provided full assistance to students in the low learning readiness category.

The implementation of differentiation in grade V of elementary school in cluster 1 Puntadewa succeeded in increasing student motivation because they felt they had more control over their learning process and could express their understanding in a way that best suited their characteristics.

Based on the results of the analysis of students' learning readiness, it was found that the level of learning readiness affects the learning process in the classroom. The implementation of differentiated learning based on learning readiness is based on the law of readiness by Edward Thorndike. Thorndike's law of learning readiness emphasizes the importance of student readiness in learning. Learning readiness is a prerequisite for effective learning activities (Dangol & Shrestha, 2019). Students who are in the high learning readiness category will do something with satisfactory results, conversely, students with a low learning readiness category will produce less satisfactory results (Wong et al., 2023). Learning readiness is defined as the condition of students to receive understanding, knowledge, and skills in learning activities (Yulianto et al., 2022). Learning readiness can be done by doing physical and psychological preparation, this includes preparing for maturity to do something and mastering basic knowledge and skills. Good student learning readiness can provide benefits and learning experiences that can improve student abilities (Strogilos et al., 2023). Factors that influence student learning readiness can be categorized into two main groups: internal and external. This classification provides a framework for understanding and managing the variables that play a role in student learning readiness. Internal factors include physical (health), cognitive (intelligence and talent), and affective (interest and motivation) aspects. External factors include family, school, community, and the surrounding environment (Smets et al., 2022) .

The implementation of differentiated learning based on learning readiness in grade V elementary school students in cluster 1 Puntadewa shows that students with a high learning readiness category can complete and achieve learning objectives very well. This is also supported by the higher scores obtained compared to other students. In line with this, Wong et al., (2023) students with high learning readiness can complete the tasks correctly and explore more widely. On the other hand, students with medium and low categories tend to get lower learning results or scores. The results of Özüdoğru's (2022) study, provide direction to prospective teachers to improve their independent learning readiness, so that later prospective teachers can provide good learning by adjusting the learning readiness of their students. Gheyssens et al., (2022) support the previous statement, with the results of their study showing that the components of student learning readiness need to be prepared to support the successful implementation of differentiated learning.

The implementation of differentiated learning based on learning readiness is adjusted to the elements of differentiated learning, namely based on content differentiation, process differentiation, and product differentiation (Grecu, 2023; Şaban & Atay, 2023; Tomlinson, 2017). The application of content differentiation means providing different learning materials for students according to their level of learning readiness. In line with (Magableh & Abdullah, 2020) explains that content differentiation is carried out because it is not possible to provide the same material or to equate material to all students, even though students have different learning readiness. Process differentiation is carried out by implementing a learning process that is adjusted based on the learning readiness of students. Process differentiation in this study was carried out in the form of differences in the learning media used, teacher instructions, and group Work Sheet which were adjusted based on the learning readiness of students. This is in line with the theory of learning differentiation (Tomlinson, 2017), process differentiation includes all student activities related to teacher instructions, textbooks used, and learning media. Product differentiation is the difference in giving assignments to make products based on learning readiness groups. Assignments carried out in product differentiation are also valuable experiences that make students understand the material better and can improve critical reasoning skills because, in the product-making process, students learn concretely and learn based on experience (Intiana et al., 2023) .

The analysis results indicate that students' learning readiness significantly influences the learning process. Differentiated learning based on learning readiness, grounded in Thorndike's law of readiness, shows that students with high readiness tend to achieve better results. Conversely, students with low readiness tend to have less satisfactory outcomes. This highlights the importance of physical, psychological preparation, and mastery of basic knowledge in supporting effective learning.

Some students in the medium readiness category showed improvement in their learning outcomes when working in groups with high-readiness students, suggesting the need for further research into the collaborative dynamics. This study is limited by its sample of grade IV-VI students, reliance on self-reported data which may introduce bias, and the lack of exploration into the long-term effects of differentiated learning. Future studies could involve larger and more diverse samples, explore the impact of peer interactions, and examine the role of teacher readiness in the success of differentiated learning. Differentiated learning tailored to students' readiness has been shown to improve learning outcomes, particularly for students with high readiness. Content, process, and product differentiation are crucial for supporting inclusive and effective learning, emphasizing the importance of adapting instruction to students' varying needs.

6. Conclusion

Based on the results of the research and discussion presented in the previous chapter, the conclusion obtained in the analysis of the learning readiness of grade V elementary school students in cluster 1 Puntadewa shows varying levels of learning readiness. There are 3 categories of student learning readiness, with categories of high learning readiness, medium learning readiness, and low learning readiness. Learning readiness can be seen from the

aspects of physical readiness, psychological readiness, material readiness, knowledge, and attitude. The use of learning with the concept of differentiation can make it easier for students to achieve learning objectives because its application is adjusted to their characteristics. Learning in grade V elementary school in cluster 1 Puntadewa has implemented differentiation learning with elements of content, process, and product differentiation that are adjusted to the learning readiness of each student. This study highlights the importance of personalized learning through differentiated instruction to accommodate diverse readiness levels. It encourages educators to regularly assess learning readiness and adapt teaching strategies accordingly. For policymakers, the research suggests investing in teacher professional development to support differentiated learning. Future studies could explore the long-term effects of differentiated learning on student outcomes.

Limitations

This study identified the need for further development in terms of student preparation strategies that were only carried out at elementary schools in cluster 1 Puntadewa, Serengan District, Surakarta City. The study has not fully taken into account external factors that can affect student learning readiness, such as family socio-economic conditions or environmental influences outside of school.

Recommendation

Given the study's limitations, it would be beneficial to consider a broader sample of schools and include external factors such as socio-economic status and environmental influences in future research. Furthermore, exploring the long-term effects of differentiated learning on student outcomes could provide deeper insights into its effectiveness. Finally, further studies could examine the role of community involvement in enhancing student readiness and overall academic performance.

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Conflict of Interest

The author declares that he has no conflict of interest related to this research and the publication of this article.

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