Differentiated Learning : The Implementation of Student Sensory Learning Styles in Creating Differentiated Content

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Abstract: This research aims to explore the implementation of students' sensory learning styles in creating differentiated content and the factors that contribute to it. The research method used was a case study with a qualitative approach. The data sources in this study were five science teachers in Grobogan District and the content documents/teaching materials they made. Interviews, questionnaires, and documentation were used to collect the data observation. In-depth observations were made in four state junior high schools. There were state junior high school 1 Purwodadi, state junior high school 1 Wirosari, state junior high school 1 Tegowanu, and state junior high school 1 Klambu. Five science subject teachers were interviewed to obtain data on implementing students' sensory learning styles in creating differentiated content and the factors that contribute to it. Questionnaires were given and filled out by the mover teachers after the interview. Documentation of content created by mover teachers was also carried out to obtain accurate data. Data validity used triangulation of sources and techniques. The results of the study showed that: (1) Students' sensory learning styles were implemented in the creation of differentiated content; (2) several factors contribute to the implementation of students' sensory learning styles in creating differentiated content, including internal factors and external factors. Internal factors include the teacher's educational background and teaching practices in class. The external factors consisted of facilities and infrastructure, and time.

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Introduction

In differentiated learning, three (3) aspects can be distinguished by the teacher so that students can understand the subject matter they are studying, namely aspects of the content that will be taught, aspects of processes or meaningful activities that students in the class will carry out, and aspects of making products that are carried out at the end which can measure the achievement of learning objectives (Putra, 2021). In terms of content, teachers can differentiate with strategies: (1) Using a variety of materials; (2) Using learning contracts; (3) Providing short-duration student workshops (mini workshops); (4) Presenting material with various learning modes; and (5) Provide various supporting systems such as facilities, policies, routines, or programs. This strategy is inseparable from the teacher's perception of students' sensory learning styles (visual, auditory, or kinesthetic) (Marlina, 2018).

Perception is how an individual selects, organizes, and interprets stimuli into a meaningful and coherent picture of the world (Schiffman & Kanuk, 2008). Individuals have different learning styles; consequently, they differ in their 'natural ways, habits, and preferences for absorbing, processing, and retaining' new information and skills". There are

many differences in learning styles and choices shown by students, so classes must be modified to accommodate different learning needs adequately (Reid, 1995).

The Ministry of Education and Culture launched the PGP program to get the right perception regarding differentiated learning. PGP is a professional development activity through training and mentoring that focuses on learning leadership to be able to encourage the growth and development of students in a holistic, active, and proactive manner in developing other educators to implement student-centered learning, as well as being role models and agents of transformation of the educational ecosystem to realize Pancasila student profile. Participants in this program are called mover teacher candidates, namely teachers who meet the criteria and have passed the selection. Prospective mover teachers will participate in educational programs, workshops, and mentoring. Prospective mover teachers who have passed and received a certificate are called mover teachers (Permendikbudristek No 26 of 2022).

Many studies related to differentiated learning have been carried out, including the results of Hardre & Sullivan's (2008) study showing that among 75 teachers in 19 secondary schools, most did not have the strategies and knowledge to motivate students at different academic levels. Many teachers need to gain knowledge about how to implement differentiated learning. The results of Dixon's research (2014) show that the number of hours of professional development has a major effect on the implementation of differentiated learning. The results of Goddard's research (2018) show a significant positive relationship between differentiated learning and teachers' abilities. The research results by Evi et al. (2018) show that teachers pay more attention to products and less to content in differentiated learning. The results of research by Heng & Song (2020) show that mastery of technology is one factor that hinders teacher perceptions and their implementation in carrying out differentiated learning. Zaier's research (2022) shows a discrepancy between teacher perceptions and their implementation in differentiation learning. The results of Suprayogi's research, et al. (2022) show a significant difference between the understanding of differentiated learning and its implementation, which is indicated by the results of the paired sample test with an average score of 104.42 for teacher understanding and 98.51 for implementation. Song (2020) shows that mastery of technology is one factor that hinders teacher perceptions and their implementation in carrying out differentiated learning. Zaier's research (2022) shows a discrepancy between teacher perceptions and their implementation in differentiation learning.

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The results of Lailiyah's research (2016) show that overall, the improvement in critical thinking skills of students who receive differentiated learning is better than students who receive ordinary learning. The results of research by Suleiman, et al. (2020) showed that differentiated learning effectively increases reading comprehension achievement in students in secondary schools. The results of Yadnya & Putra's research (2021) show that implementing a flipped classroom learning model based on a differentiation strategy in learning physics can improve the critical thinking skills of class XII IPA3 high school students. The results of Suwartiningsih's research (2021) show that content differentiation learning by the teacher by providing material in the form of slides and videos shown to all students in the class does not show a significant increase in science learning outcomes. The results of Saprudin & Nurwahidin's research (2021) show that the differentiation method increases student enthusiasm and enthusiasm in working on reflections on Islamic Religious Education so that learning is fun and impacts shaping student character according to the Al-Quran and Hadith.

The results of Nurdini's research (2021) show that based on the results of the mapping, data were obtained for class IX students with Kinesthetic (movement), Audio (listen), Visual (see), and Audio Visual (listen and see) learning styles. The results of Alhafiz's research (2022) show that no students rely only on one learning style. Student learning styles show a combination of the three learning styles: visual, auditory, and kinesthetic. Pidrawan's research (2022) shows that teacher's mover Indonesian subjects to differentiate the content by preparing learning material (content) for students online and offline. Various content is uploaded by activating teachers for the elementary level in learning to write impressions, namely caricatures, videos, and examples of text impressions on various objects.

This study is different from Hardre & Sullivan's (2008); Dixons (2014); Goddart (2018); Eve et al. (2018); Heng & Song (2020); Zaier (2022); and Suprayogi, et al. (2022). The difference lies in the research subjects. The subjects of this study were activating teachers who received training related to differentiation learning, while their research subjects were teachers who had not received training related to differentiation learning. This research is also different from Lailiyah's research (2016); Magableh et al. (2020); Yadnya & Putra (2021); Suwartiningsih (2021); and Saprudin & Nurwahidin (2022). The difference lies in the subject and research objectives. In this study, the research subjects were mover teachers, while in their research, the students were the research subjects.

This research differs from Nurdini's (2021) and Alhafiz's (2022) research. The difference lies in the subject and research objectives. The purpose of this study was to explore the implementation of students' sensory learning styles in creating differentiated content and the factors that influence it, while their research was to determine the effect of differentiated learning on student motivation and learning outcomes. In contrast, their research aims to map students' learning styles. The subjects in this study were mover teachers, while the subjects in their research were students.

This research is different from Pidrawan's research (2022). The difference lies in the subjects and subjects studied. The subject of this research is the mover teacher, while in Pidrawan's research, the subjects are elementary school students. The subjects studied in this study were natural sciences, while in Pidrawan's study, they were Indonesian. Research related to differentiated learning has been carried out, but it is still limited to differentiated learning based on students' learning interests and readiness. There is no research on differentiated learning based on students' sensory learning styles. Differentiated learning research for Islamic Religious Education and Indonesian has been carried out, but there has yet to be research related to science subjects. Research on implementing differentiated learning on mover teachers has been conducted, but it is still general. There is no specific research on creating differentiated content. Therefore, this research aims to explore the implementation of students' sensory learning styles in creating differentiated content and the factors that contribute to it.

Research Method

This study used a case study method with a qualitative approach. The data sources in this study were five science teachers in Grobogan Regency and the content/teaching material documents they made. Data collection techniques were used observation, interviews, questionnaires, and documentation. In-depth observations were made in four state junior high schools. There were state junior high school 1 Purwodadi, state junior high school 1 Wirosari, state junior high school 1 Tegowanu, and state junior high school 1 Klambu. For obtained data related to the implementation of students' sensory learning styles in created differentiated content and the factors contributed to it, interviews were conducted with five science subject teachers. Questionnaires were given and filled out by the mover teachers after the interview. Documentation of content created by mover teachers also carried out to obtained accurate data. The validity of the data used triangulation of sources and techniques.

In this study, the data obtained from science subject teachers regarding content differentiation learning through interviews and questionnaires must be tested by checking supporting documents and observations. Data validation used an expert judgment model by asking for expert opinion. The interactive data validation technique consists of three components: data reduction, data presentation, and conclusion. At the data reduction stage, the researcher summarized the data from observations, interviews, questionnaires, and documentation to obtain some basic data. Data presentation was done by compiling the data obtained after the data has been reduced so that the researcher's data can be easily understood. (Miles and Huberman, 2014).

Results and Discussion

The study results show that the implementation of students' sensory learning styles in creating differentiated content includes videos, reading materials/text, Student Activity Sheets (LKPD), Charts, and graphs and curves.

Video

The study results show that videos are made to meet the needs of students with visual and auditory learning styles. The videos made by mover teachers vary according to the material being taught. Videos were obtained from YouTube, student products, and Google Meet recordings of the previous year's learning process. The video and video link were shared in the class WhatsApp group the night before the learning activities were carried out. Students

listen to the video. When the teacher gave the discussion sheet, it turned out that the students could finish it well. The following documentation also supports the results of this study:

Figure 1. Video Made by the Mover Teacher

Reading material/text

The study results a show that reading materials/texts are made to meet the needs of students with a visual learning style. Reading materials are equipped with pictures to clarify learning material. The reading material contains material on human reproductive organs, spermatogenesis, and oogenesis. At the end of the reading material, students are given practice questions. These practice questions are used as a measuring tool to determine students' understanding of the material they are studying. Reading materials made by mover teachers are in the form of printouts and links. Printouts are distributed to students during learning. The teacher shares the link in the class WhatsApp group. After learning, the teacher gave questions to students; it turned out that students could answer correctly. The following documentation also supports the results of this study:

Figure 2. Material in the Form of Reading Material in the Form of Print Outs and Links

Student Activity Sheet (LKPD)

The results showed that Student Activity Sheets (LKPD) were made to meet the needs of students with a kinesthetic learning style. LKPD contains material with activity steps (work instructions) to make learning easier for students. Students will read the LKPD, see the content, then practice. LKPD made by the mover teacher is printed and distributed during the lesson. Apart from being printed, the LKPD was also distributed to students as a link. The results of this study are also consistent with the results of the following documentation:
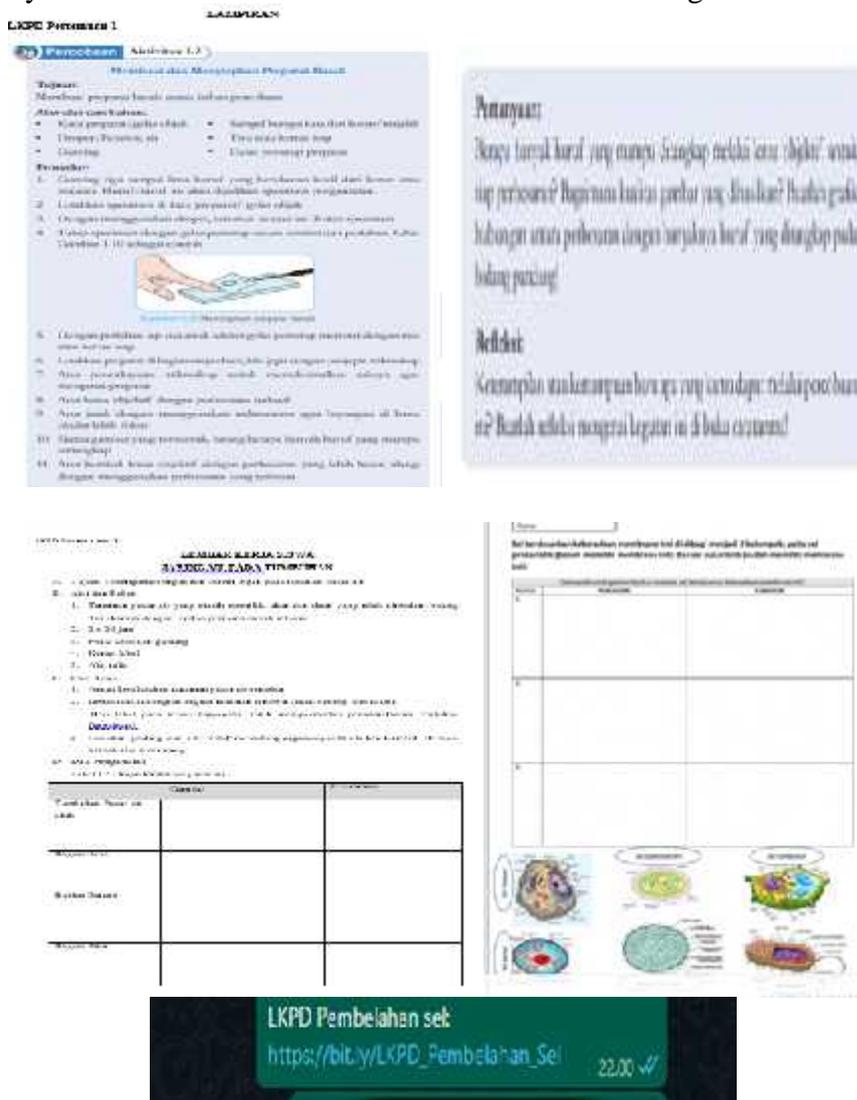

Figure 3. LKPD in Print/Print Out Form and Link

Charta

The study results show that charts are made to meet the needs of students with a visual learning style. Charta was created to help students learn. Charta helps change abstract material into concrete material. The material on the charts is in the form of micro/very small (e.g., cells), macro/very large such as the universe, organs, and physiological processes. Materials that cannot be seen with the naked eye can be shown with pictures and charts. The results of this study are consistent with the results of the following documentation:
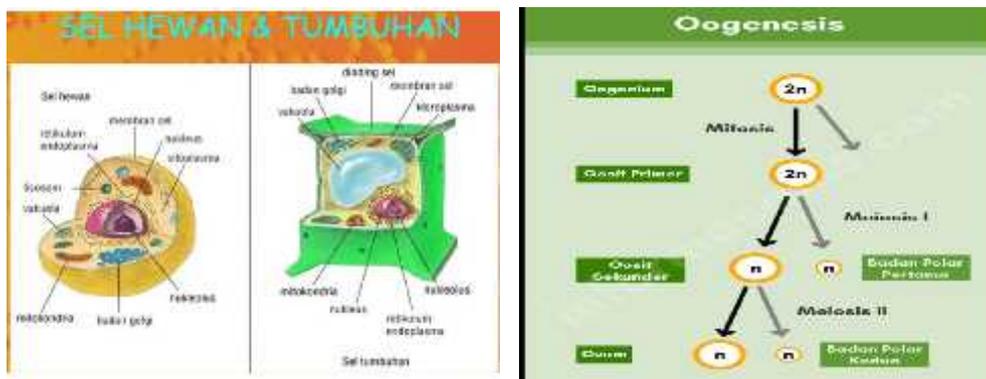
Figure 4. Charta

Graphs and Curves

The study results show that graphs and curves are used to meet the needs of students with a visual learning style. Curves and graphs are used as supplementary reading material to show stages/cycles and comparisons in numerical form. Students translate curves and graphs to understand the concept/material being studied. The results of this study are consistent with the results of the following documentation:
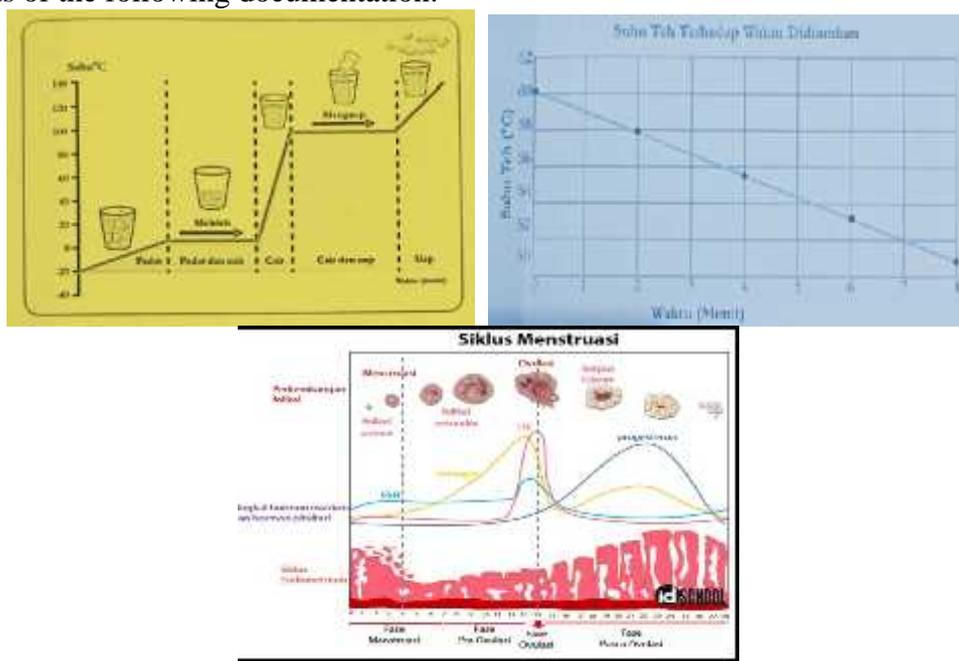

Figure 5. Curves and Graphs

The exposure above can be summarized in the following table:

Table 1. Implementation of Students' Sensory Learning Styles in Creating Differentiated Content

Kinds of content	Information
Videos	Videos in the form of downloads from YouTube and student products in the previous year, contains material on vibration, reproduction in plants, and magnetism.
Reading material/text	Reading books/texts were taken from textbooks and the internet. Print out form and links cell material and microscopy and cell

	division.
LKPD	In the form of print outs and links to cell material and microscopy as well as cell division.
Charta	Made of paper with a square shape containing cell material and division cells that include oogenesis and spermatogenesis.
Graphs and curves	In the form of graphs and curves of experimental results regarding the number of pulses and temperature tea on cooling time, as well as the menstrual cycle.

Factors contributing to implementing students' sensory learning styles in creating differentiated content include educational background, classroom teaching practices, and external factors.

Educational background
The results of the study showed that the educational background of the mover teachers contributed to the implementation of students' sensory learning styles in creating differentiated content. Teachers with an educational background in the teaching faculty were only slightly introduced to students' sensory learning styles. At the same time, teachers who have an educational background in non-teaching faculties have yet to be introduced to students' sensory learning styles.

Classroom teaching practices
The study results showed that classroom teaching practices affected the implementation of students' sensory learning styles in creating differentiated content. The practice of teaching in this class was closely related to the mover teachers' educational background and length of service. Differentiated learning was rarely implemented in the classroom. The teacher needs help managing the class. Then the results are less than optimal.

External factors
The study results showed that external factors were influenced the implementation of students' sensory learning styles in created differentiated content included facilities, infrastructure, and time. Inadequate facilities and infrastructure caused teachers' difficulties in created differentiated content. So is time. Teachers need a long time to create differentiated content. The exposure above can be summarized in the following table:

Table 2. Factors that Contribute to the Implementation of Students' Sensory Learning Styles in Creating Differentiated Content

Kinds of content	Information
Educational background	Not all teachers have an educational background.
Classroom teaching practices	Teachers with a longer educational background and tenure have a better ability to implement students' sensory learning styles in creating differentiated content so they can manage the class well.
External factors	It takes adequate facilities and infrastructure and a relatively long time to create differentiated content.

Discussion

Implementation of student sensory learning styles in creating differentiated content

This finding supports the results of Suwartiningsih's research (2021), which shows that learning differentiates content by the teacher by providing material in the form of slides and videos that are shown to all students in the class. This finding reinforces Pidrawan's research (2022), which shows the variety of content uploaded by activating teachers at the elementary level in learning to write impressions, namely caricatures, videos, and examples of text impressions on various objects. The variety contents uploaded by junior high school Indonesian language subject teachers in learning to write reviews, namely PowerPoint, content summaries in pdf format, videos, and examples of review texts from various media.

This finding also reinforces Irdhina's opinion (2021), which states that in differentiated learning, there are three ways to create different lesson content, namely: 1) Adjusting what the teacher will teach or what students will learn based on the level of readiness; 2) Adjusting what will be taught by the teacher or what will be learned by students based on the interests of students; and 3) Adjusting how the content to be taught or learned will be conveyed by the teacher or obtained by students based on the learning profile owned by each student. It is assumed that in this study, the mover teachers' content follows each student's learning profile.

However, these findings do not support the research results of Ismajli, et al. (2018), which show that the implementation of differentiated learning in public and private elementary schools is not following the perceptions of each teacher. Teachers pay more attention to product differentiation and pay less attention to content and process differentiation. This finding does not support the results of Zaier's research (2022) which shows a discrepancy between teacher perceptions and their implementation in differentiation learning. Efforts are needed to prepare teachers to differentiate instruction regarding content, process, product, and environment. This finding also does not support the results of Maulana's research (2020) which shows that there are differences in the implementation of differentiated learning among teachers in the Netherlands and South Korea. It is assumed that in previous research, the teacher who was the subject of the study did not yet have proper knowledge regarding students' sensory learning styles. Hence, the implementation of differentiated learning in the classroom was not effective.

Factors that contribute the implementation of students' sensory learning styles in the creation of differentiated content

The implementation of student sensory learning styles in creating differentiated content is influenced by several factors, including the teacher's educational background, teaching experience in the classroom, and external factors in the form of facilities and infrastructure, and time. This finding supports the results of Dixon's (2014) study, which showed that a more significant number of hours of professional development in teaching differentiation is positively related to teacher efficacy and a sense of teacher efficacy beliefs. Teacher competence is essential in applying the differentiation process regardless of the level or content area the teacher teaches (elementary, junior high, or high school). This finding supports the research results of Faiz et al. (2022), which stated that the teacher's ability to choose the models, approaches, and methods needed in designing material is essential. To increase the motivation and effect of learning for students based on harmonious interpersonal relationships between students and teachers so that students can be more enthusiastic about

learning. Of course, the role of a creative teacher is needed in differentiated learning to lead students to success and happiness in learning.

This finding also supports Goddard's research (2018) results, which show a statistically significant positive relationship between the implementation of differentiated learning and teacher abilities. This finding also supports Mokhlis' research (2021), which states that the teacher's tenure influences the perception and implementation of differentiated learning. Teachers with less than ten years of service have poor perceptions compared to teachers with more than 11 years of service, thus affecting implementation in the field. However, these findings do not support Derbala & Yasin's research (2022), which stated that the level of knowledge and implementation of learning differentiated teachers was low, measured using a Likert scale, and analyzed using SPSS. The main causal factor is the teacher's low perception of differentiated learning, the mindset of the teacher who does not want to change so that he still implements teacher-centered learning.

It was assumed that in previous research, the teacher who was the subject of the study did not have the right perception regarding students' sensory learning styles in differentiated learning, so implementation in class was ineffective. Several factors may have contributed to the gap experienced by these teachers. According to Borg (2003), several factors contribute to a teacher's perception, including educational background, teacher training, classroom teaching practices, and external factors. Factors that contribute to Ismajli's research results et al. (2018); Zaier (2022); Maulana (2020); and Suprayogi, et al. (2022) are teacher training and teaching practice in the classroom. It was assumed that the subjects in their research were teachers without training in differentiation learning. These teachers do not have sufficient teaching experience. It can be seen from their profile. Most of them are pre-service participating teachers and teachers with less than five years of service. In this study, the research subjects were mover teachers who had worked for more than ten years and had received training on student sensory learning styles and differentiation learning. Through this training, activating teachers have the right perception to implement content differentiation learning effectively.

Conclusion

The results of the study showed that: (1) Students' sensory learning styles were implemented in the creation of differentiated content; (2) several factors contributed to the implementation of students' sensory learning styles in creating differentiated content, including internal factors and external factors. Internal factors included the teacher's educational background and teaching practices in class. The external factors consisted of facilities and infrastructure, and time. Several factors influenced the implementation of students' sensory learning styles in creating differentiated content, including internal and external factors. Internal factors included the teacher's educational background and teaching practices in class. The external factors consisted of facilities and infrastructure, and time.

Recommendation

In this study, the facilities and infrastructure owned by schools are still limited, so they become an inhibiting factor in implementing content differentiation learning. It is better if the school principal completes the facilities and infrastructure the teacher needs to support the implementation of differentiated learning in schools. The teacher's lack of ability to manage the class is one of the inhibiting factors in differentiation learning. It is recommended that teachers actively participate in continuous professional development activities through

training held at the Subject Teacher Consultation forum to implement differentiated learning in the classroom effectively. In addition, teachers must be able to manage time well and increase creativity to support the implementation of differentiated learning. This research is limited to implementing content-differentiated learning with science subject teacher respondents. For further researchers, they can conduct research on content differentiation learning by involving more respondents, namely mover teachers from different subject backgrounds. Future research is expected to provide a broader picture regarding in implementing students' sensory learning styles in creating differentiated content and the factors that contribute to this.

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