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# Literature Study on the Importance of Differentiated Strategy Approach to Biology Learning in Senior High School

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**ABSTRACT**

Knowledge of understanding differentiating strategies is still not widely known by educators so that in journals the study of literature aims to describe the differentiating approach strategies in schools as reading material for knowledge to adapt learning based on the needs of students regarding aspects of content, processes, products, and a comfortable learning environment. This research method uses a literature study approach by collecting references consisting of several previous studies which are then combined to draw conclusions from the readings included in qualitative research, namely research that uses a natural setting with the intention of interpreting the phenomena that occur and is carried out by involving various methods which exists. The results of the study show that students feel comfortable when educators apply the process of learning activities according to the needs of students so that the implementation is in accordance with the theory for reference to applying learning and knowing the opinions of students regarding differentiated learning strategies. The conclusions in the literature review serve as reference material for implementing a differentiated learning process in the classroom so that there is behavior to adjust learning with learning readiness to achieve learning goals and can be used for further research material related to the implementation of the application of a differentiated approach and is useful for designing steps using learning strategies differentiate according to the needs of students in the school environment and implementation in society and advanced research materials for implementation in the school environment.



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## INTRODUCTION

Field Experience Practice (PPL) provides experience related to the learning process environment in a classroom that already has complete facilities and infrastructure for students. The learning environment should be fun and interesting so that students feel at home in the classroom by paying attention to the safety and comfort of students in learning, playing, and the spatial arrangement must be

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in accordance with the space for students to move (Maknun, 2013). A pleasant and conducive learning environment can create a classroom atmosphere and learning environment that supports learner-centered learning activities (Arianti, 2017). Learning activities that adjust the learning environment of students so that learning is centered on students. Learner-centered learning is a learning activity that places learners at the center of the learning process to become more cooperative (Satriaman, *et al.*, 2018). Learners have different diversity so that in learning activities a teacher must have an understanding of learning strategies that suit the needs of students. According to Magdalena, *et al.* (2020) educators are required to have skills and abilities in selecting methods that are in accordance with learning outcomes.

Based on direct observations using observation sheets during Field Learning Practice (PPL) activities at school during guided learning activities, students are usually bored, not focused on paying attention to educators explaining learning materials because they are busy with their own activities such as using cellphones, talking with friends, drawing activities, coloring, and doodling notebooks/learning books and sometimes students are embarrassed to ask questions in class for fear of being ostracized by their classmates. Learners feel uncomfortable and do not pay attention when educators explain learning materials because they are not in accordance with their learning needs. Factors that cause students to not pay attention to the educator's explanation and feel bored because the material and teaching methods are less interesting and monotonous (Magdalena, *et al.*, 2020). According to Hidayat and Abbas (2018) students who feel less interested in monotonous methods cause boredom and boredom in learning activities in the classroom environment. The impact on learning, students become less active in the classroom.

One of the learning methods that can be applied by educators in the classroom is the differentiated learning strategy approach method. According to Wahyuni (2022), a differentiated approach facilitates students according to their needs, because each student has different characteristics, so they cannot be given the same treatment. This is supported by Ngaisah, *et al.* (2022) a differentiated approach gives students the freedom to be creative with their abilities without pressure and coercion from other parties. Educators must have knowledge and understanding related to differentiated strategies to map students in the classroom.

According to Siburian, *et al.* (2019) differentiated strategies in the learning process by meeting the needs / desires of learners so as to develop abilities in terms of cognitive, affective, and skills. Care in paying attention to the needs and strengths within students characterizes differentiated learning (Marlina, 2020). The differentiated learning strategy implemented is learning that is in accordance with the needs and characteristics of students with differentiated aspects, namely content, process, product, and student learning environment with the aim of developing cognitive, affective, and psychomotor.

Learning activities that can use differentiated strategies are Biology. According to Sutarto, *et al.* (2021) biology in the learning process is contextually related to providing direct learning experiences to students by leading to have basic science concepts that are applied in everyday life. One of the biology materials that can provide direct experience to students is Biotechnology.

Biotechnology material is the science of processing raw materials by utilizing microorganisms to produce goods and services that utilize the role of microorganisms,

animals, and plants, (Darmayani, 2021). According to Indrawati, *et al*. (2021) learning materials can be presented creatively, innovatively and fun in order to arouse the interest of students to be able to actively discover concepts, principles, theories and science facts. Learning biotechnology materials with differentiated learning strategies can be related to the process, content and product aspects of biotechnology materials. This can have a meaningful impact on students in the learning process and increase students' interest in learning in the classroom. Although the theory of differentiated learning is not new in education and can be related to biology materials, research on the practice or application of differentiated learning in the classroom is still very limited in number due to lack of understanding related to differentiated strategies. The existing literature review mostly describes concepts, components and strategies rather than practices in differentiated learning.

In Indonesia, literature reviews that examine the differentiated approach are still very few. Literature review that specifically examines the application of differentiated learning in Biology learning does not even exist. Based on the background of the problem, researchers feel interested in carrying out a literature review research on the application of a differentiated approach in learning Biology "Biotechnology" based on aspects of content, product, process, and learning environment by conducting a literature review entitled "**Literature Study: The Importance of Differentiated Strategy Approach in Biology Learning in High School**". The purpose of the literature review is to describe the differentiated strategy approach and analyze aspects of the differentiated approach in learning Biology "Biotechnology", procedures for implementing a differentiated approach. The benefits of literature review research for understanding the differentiated approach and designing learning activities according to the needs of students in the classroom.

## METHOD

### *Research Methods*

The method in this literature review research uses a literature study approach which is carried out using literature in the form of books, research journals. Literature studies are carried out by collecting references consisting of several previous studies which are then combined to draw conclusions from the reading (Mardalis, 1999). Literature review is included in qualitative research, which is research that uses a natural setting with the intention of interpreting phenomena that occur and is carried out by involving various existing methods (Kulthau, 2002). The procedures in this study were carried out in accordance with those proposed by Kulthau (2002):

1. Selection of the theme to be discussed or interested in.
2. Implementation of information exploration activities related to the theme to be discussed.
3. Determination of the direction of research to be carried out.
4. Collecting data sources from various relevant sources.
5. Presentation of data results from aspects of the differentiated approach.

### *Data Analysis*

The data analysis technique used in this research uses content analysis which can be used for the purpose of finding references that are relevant, valid, and can be used and utilized for research again (Kulthau, 2002). The analysis that will be carried out is to select, compare, combine, and sort with the

aim of making the research results more structured and relevant (Mardalis, 1999).

## RESULTS AND DISCUSSION

### *Defferentiation Method*

The new knowledge related to differentiated strategies has not been well understood by educators so that in implementing learning activities using conventional methods focuses without paying attention to the learning needs of students in the classroom who have diverse characteristics. The literature study review explains the understanding and knowledge to be related to learning methods that pay attention to the characteristics and needs of learners who vary individually. Characteristics that are in accordance with the needs of students, namely in terms of interest, readiness, creativity of students in the classroom (Marlina, 2020).

A differentiated approach is where educators use a variety of methods to meet the needs of learners in learning with characteristics based on learning readiness, interests, and learning styles (Tomlinson, 2001). A differentiated approach strategy that includes activities to meet, and recognize the diversity of learners in learning according to the interests, readiness, and learning preferences of learners in the classroom environment (Naibaho, 2020). According to Marlina (2020) differentiated learning has differences from learning that does not apply a differentiated approach (Conventional). This difference can be seen in Table 1.

**Table 1.** Differences between Differentiated and Conventional Approaches

| Differentiator | Differentiation | Conventional |
|---|---|---|
| **Learning** | Flexible | Labeling |
| **Classroom Assignments** | Provide learning tasks according to the interests and learning readiness of learners, but still refer to learning objectives | Assuming learners are not capable of higher order thinking and tasks |
| **Learning Basics** | Learning needs and assessment | Not based on assessment and learning needs |
| **Learning Activities** | Structured learning activity | Unstructured learning activity |

The differentiated approach strategy is threefold: content differentiation, process differentiation and product differentiation. Differentiated learning uses multiple approaches in content, process and product. In a differentiated classroom, teachers will pay attention to three important elements in differentiated learning: (1) content, which is what students learn, (2) process, which is how students get information and make ideas about what they learn, and (3) product. These three elements will be modified and adapted based on the assessment conducted according to the students' readiness level, interests and learning profile (Andini, 2016).

Educators to implement a differentiated approach need knowledge related to the steps in design and implementation. According to Kulthau (2002), planning a differentiated approach is to determine learning objectives; map students' learning needs (learning readiness, interest, learning profile; determine the strategies and assessment tools to be used; and determine the differentiated learning activities to be carried out (content, process, product).

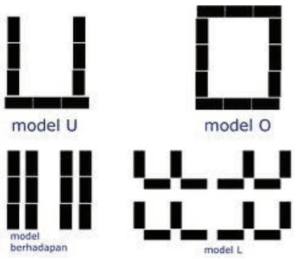
### *Aspects of Differentiation Strategy*

**Aspects of the learning environment**

The learning environment is very

influential on the process of learning activities, both the physical environment and the social environment. The social environment that students can do in class is when forming groups (Wahyuningsih, 2013).

Learners can sit based on their group according to their wishes. For example, U-shaped, circular (according to the conditions of the classroom environment). According to Tomlinson (2001), the management of the learning environment during differentiated learning process activities can be carried out in the aspects of content, process, and product.




*Source: https://www.guru-id.com/2019/09/model-tempat-duduk-meja-kursi-kelas.html*

**Figure1.** Seating Model

The learning environment is adjusted to the readiness of learners in learning process activities that pay attention to their interests, and their learning profiles in order to have high motivation in learning. For example, educators prepare several seating arrangements for learners that are posted on the class bulletin board according to learning readiness, interests, and learning styles (Purba, *et al.*, 2021).

**Content Aspect**

According to Purba, *et al.* (2021), the content aspect is a learning method by providing material to students based on their skills, learning profiles, and knowledge, but still in line with the applicable curriculum. The material presented can vary according to the mapping of students' interests in certain learning materials. The content aspect contains material that is taught to students to master the material with direction and responsibility by educators to master the material (Sopianti, 2023).

- Educators provide stimulus by showing pictures and videos of foods through power point shows (PPT) and through youtube links that can be accessed through the link: https://www.youtube.com/watch?v=MzxgzIn3jzU
- Learners provide questions/ideas/ topics to be discussed about biotechnology. Topics discussed are the concept of biotechnology, types of biotechnology, conventional fields and food fields, agricultural fields, industrial fields, medical fields, animal fields, modern biotechnology, transgenic plants, transgenic animals.
- Learners choose their own topics to be discussed. The selection of topics can be seen from the links to information sources and teaching materials that have been provided as follows:

**Information Source Link**

- https://www.sehatq.com/review/cara-membuat-yoghurt
- http://www.litbang.pertanian.go.id/info-teknologi/2843/
- https://dispertan.bantenprov.go.id/lama/read/artikel/1455/Mengenal-Tanaman-Transgenik.html
- Teaching materials can be accessed by learners at the link https://www.sehatq.com/review/cara-membuat-yoghurt http://www.litbang.pertanian.go.id/info-teknologi/2843/

**Product Aspect**

The product aspect explains the form of students' understanding of learning shown by educators (Naibaho, 2023). According to Tomlinson (2001) the products resulting from learning can show the understanding of the

ability of knowledge, skills, understanding of students after participating in the learning process activities in the classroom. According to Mills, *et al*., (2014) the product is a manifestation of learners' understanding of learning materials. Types of products that can be made by learners are powerpoint (PPT), video, song, infographics, main maps.

- Educators provide instructions that the results of group discussions can be collected by making infographics, silent videos, videos, PPT, main maps, posters, or articles according to group agreements.
- Educators provide Learner Worksheets (LKPD) as a reference for students in gathering information related to problem identification.
- Learners present the results of the discussion according to the form of results chosen by the group. Group 1 based on visual learning style: Infographic shared on Instagram; Group 2 audio visual. Video is available at the following link: https://www.youtube.com/watch?v=5WUic8hSBe4&t=3s ; Group 3 *Powerpoint* (PPT) liveworksheet

**Process Aspect**

The process aspect of activities that are meaningful to learners as their learning experience in the classroom (Tomlinson, 2001). Educators need to understand learners will learn in groups or independently and observe the amount of assistance that will be given to learners in depth or guide independently (Swandewi, 2021). According to Naibaho (2023) educators design learning according to the needs of students from learning styles, learning readiness to make lesson plans.

- Educators provide more stimulus to the undeveloped group, some stimulus to the developing group and confirmation to the advanced group.
- Educators monitor students in finding references for group discussion materials to groups that are not yet developing, assisting developing groups and monitoring advanced groups.
- Educators provide guidance in the advanced, developing, and more in the less advanced groups.

Learning activities guided by educators will get a response from students. According to Hidayat & Maemonah (2022), the response to the material taught during the learning process takes place in the form of affective behavior which is seen when students concentrate on learning activities.

***Objectives of Learning Strategy Aspects***

Educators before carrying out learning activities always map learning readiness by providing diagnostic assessments so that educators are able to get information to serve as indicators in the learning process activities. This is because an educator has an important role in exploring the interests of students, in order to support the achievement of meaningful learning (Kulthau, 2002). According to Tomlinson (2001), educators in designing learning according to differentiated aspects have goals including: a) helping learners realize that there is a match between school and their own desire to learn; b) showing the connection between all learning; c) using skills or ideas that are familiar to learners as a bridge to learning ideas or skills that are less familiar or new to them, and; d) increasing learners' motivation to learn.

Content aspects that can be applied to biotechnology material are the concept of biotechnology, types of biotechnology, and the fields of food, agriculture, industry, medicine, animal husbandry, modern biotechnology, transgenic plants, transgenic animals. Resources that can be provided by educators to learners are in the link:

- https://www.sehatq.com/review/cara membuat-yoghurt.

- http://www.litbang.pertanian.go.id/info-teknologi/2843/
- https://dispertan.bantenprov.go.id/lama/read/artikel/1455/MengenalTanamanTransgenik.html

Application with content aspects is useful for providing learners' freedom to explore choosing learning resources according to their interests (Sarie, 2022). Learner exploration along with a pleasant and conducive learning environment can create a classroom atmosphere and learning environment that supports learner-centered learning activities (Arianti, 2017).

The learning process activities guide students in discussion because to analyze learning done in groups by making various learning media (Andini, 2016). One of the media that is usually used is the YouTube channel because of the visual, audio, and audio visual elements.


**Figure 2.** Biotechnology Powerpoint Slides

According to Mills, *et al*. (2014), product differentiation is a form of students' understanding of learning materials that can be used as an assessment of students' abilities and determinants for further learning. The products produced by students are diverse because the materials used are diverse which can develop creativity, innovation, and shape according to the creativity of each group (Gray, 2020).

The type of product produced varies greatly, it can be in the form of written observations, presentations, videos, songs, etc., infographics, videos, podcasts and powerpoints (PPT).


(a) (b)

(c)

**Figure 3.** Product Aspect Creations: a) Infographic; b) Poster; c) Powerpoint (PPT)

The product aspect differentiation strategy approach provides meaningful, challenging, and relevant experiences for students because it is able to develop creative thinking skills and collaboration between students (Sarie, 2022). Making products is useful for knowing the broad understanding of students related to the material studied both individually and in groups by developing creativity for the products produced.

Educators' knowledge of differentiation can influence learners' knowledge, attitudes and skills in the classroom and society. According to Insani and Kukuh (2023), students can learn more effectively when educators apply differentiated learning because the learning process that takes place is in accordance with the needs of students. For example, educators apply aspects of process differentiation by providing learning materials according to the learning styles of learners presented in the form of articles, videos, and practicums, then learners will understand the material according to the learning style of each learner.

The application of a differentiated approach based on its aspects is one solution in meeting the different learning needs of students based on their readiness, interests and learning profiles which have an impact on helping students achieve their learning targets optimally (Sopianti, 2023). An educator must know that there is more than one method, strategy, and way to understand the subject matter in implementing differentiated learning so that it suits the learning needs of students with an impact in the cognitive, aspective, and psychomotor fields. Wahyuni (2022) learning with a differentiated approach, all the needs of students in learning material can be according to their interests or learning profiles. Learning through a differentiated approach helps teachers to recognize and design learning in accordance with the nature of biology, namely by paying attention to the differentiation of content, process, and product. The differentiated learning process can also provide ample space for students to demonstrate what they have learned so that differentiated learning indirectly encourages students' creativity (Herwina, 2021).

## CONCLUSION

Based on the results of the literature review, learning to apply a differentiated approach can help accommodate according to the learning needs of students by paying attention to interest, readiness, knowing students and learning styles. Understanding related to differentiated strategies is very suitable to be applied in an independent curriculum so that it can adjust the needs of students to the aspects of content, process, product, and learning environment. Biology lessons on Biotechnology material can be implemented from the product aspect in the form of infographics, posters, powerpoint (PPT); content aspects in the form of source material from educator reading materials, YouTube, articles, online sources and textbooks by increasing the creativity of students in the classroom. The process aspect provides guidance according to the needs of developing, developing and advanced when completing the assigned tasks according to the group seating plan so as to create a comfortable learning environment for each group member.

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