

## Smartphone Media Analysis in Differentiation Learning and Learning Time Management of Students in Schools

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**Abstract:** Differentiation learning still needs to be carried out in the classroom, and teachers prefer to carry out learning with uniformity even though they face various characteristics of students from cognitive, affective, and psychomotor abilities. The presence of smartphones can support current learning activities. The question is whether smartphones can form differentiated learning and shape student learning management. This study aims to analyze the use of smartphones in differentiation learning and student learning management. The method used in this descriptive-based analysis. The results of this study are presented in the form of exposure using observational data collection techniques, interviews, and documentation. The research location is in the Bantul teacher working group. The focus of this research is to explain the role of smartphones and differentiated learning management analysis. From implementing differentiated learning in elementary schools, using smartphones in classroom learning can be aligned with four stages: learning preparation, interests, processes, and learning products. Smartphones can support learning management, including study schedules, distraction awareness, and task planning. Smartphones fulfill creative learning and differentiation in the Merdeka Belajar Curriculum. Teachers can innovate using smartphones; students can choose learning needs according to their talents and interests.

**Keywords:** *Differentiation, Learning Management, Elementary school*

### INTRODUCTION

Differentiated learning explores learners' diverse needs and characteristics and helps teachers create a learning process. Teachers must have in-depth educational knowledge equal to what we know, want to know, and have learned. An example of a class that applies differentiated learning is when learning, the teacher equips students with various ways to explore the content of the curriculum, the teacher also provides various meaningful activities for students to understand and develop knowledge and ideas, and the teacher equips students with various ways to present what they have learned (Made, 2022). Education cannot be homogenized but must respect the differences in children, ranging from uniqueness, talent, desire, and other expressive things. This means that it is not good to homogenize and consider learning unnecessary. According to (Tomlinson, 2001), Differentiated learning is any attempt to adjust classroom learning to meet students' learning needs. Differentiated learning combines teachers' rational choices to meet student's needs based on learning objectives, teachers' responses to students' learning needs, and an environment that invites learners to learn more enjoyably.

In differentiated learning, students are not just delivering or receiving teaching materials. However, there needs to be explicit materials and media to deliver and receive teaching materials properly. Differentiated learning is learning that teachers do to meet the learning needs of students in the classroom, including teaching dispositions, interests, and learning profiles (Faiz et al., 2022). In carrying out the teaching and learning process, it is necessary to

plan learning to run effectively and efficiently to stimulate student activeness (Ahmad Susanto, 2013). Teachers play the role of teachers, motivators, facilitators, mediators, evaluators, mentors, and reformers, so they are required to be able to master materials related to technological developments (Amaliyah & Zakhra, 2021). Technological advances encourage many changes, one of which is in the field of education, which gave birth to the concept of media or learning resources using smartphones. Smartphones will be effective and efficient because learning is not only fixated on meetings between teachers and students in one time, one direction. Smartphones can help teachers explain abstract subject matter, build children's critical thinking, and be creative and fun so students can easily understand the subject matter. (Setiawan et al., 2022). Smartphones can function as teaching materials and learning resources for students outside or within school hours.

At the elementary school level, smartphones are very influential in the level of concentration and dependence of students. The right solution to eliminate support or inappropriate use value requires time management so that children are not addicted and realize the role of smartphones is not just entertainment (Sandrawita, 2019). For students, especially at the elementary school level, time management is essential because, at this level, it is the initial educational level of children's success in the future. Proper learning time management will affect students with outstanding learning outcomes (Nurrahmaniah, 2019). However, students who do not have good study time management will have low learning outcomes and affect the learning process. Time management can be done by making the best possible schedule to organize the daily routine. This regular habit will shape the character of a child who is more disciplined and responsible so that they understand very well how smartphones are used.

How the use of Smartphones in the differentiation learning process research conducted by (Chusna, 2017) explains, Smartphones have the potential to affect individual lives and even education. Smartphones have positive and negative impacts on various aspects of people's lives. For example, the positive impact is increasing insight, facilitating communication access, and training children's creative level. However, on the other hand, smartphones also have a negative impact, especially for teenagers and children. Management that becomes a problem for parents when students use smartphones is in the context of organizing learning activities and directed smartphone use. Learning time management, which can potentially hold back students, is one of the facilities that need to be following their use (Wahidaty, 2021).

One of the problems of using smartphones in the school environment is that it cannot encourage maximum activities and regular learning management due to smartphones. The use of smartphones in the era of the independent curriculum sought to maximize students' learning potential according to the needs of learning outcomes for analysis of the impact of smartphones on differentiated learning to align with learning time management that has the potential to support or hinder learners. Undeniably, teachers must be the center of motivation and the application of creative learning and have technological capabilities according to time management to achieve maximum learning outcomes. However, this needs to be tested with smartphones to support differentiated learning, not to be misused, such as for playing games outside of learning activities.

Smartphones in the learning process are a tool to facilitate the teaching and learning process, such as adding learning resources. Since an independent curriculum has been implemented in Indonesia, namely the Merdeka Curriculum, learners must be active in teaching and learning activities, such as independently searching for their resources on the Internet as needed. There are various facts about the emergence of smartphone use for learners. One of the negative impacts of smartphones on learners is smartphone addiction, so the time that should be used for learning is reduced. However, some innovations can emerge from an active teacher using smartphones as a communication medium and content creator, inviting students to have

more fun in learning (Sandrawita, 2019). This shows the negative and positive impacts on the learning environment of students.

The collaboration between differentiated learning and smartphones will lead to learning management and learning outcomes at school, whether it changes or decreases. Therefore, it is necessary to investigate the use of smartphones in differentiated learning and learning time management in students. It is essential to examine these issues because this is an exciting topic in using smartphones for teachers, differentiated learning in schools, and learning time management. Learners, especially at the elementary school level, are early education learners who need to be considered and given real examples and motivation in front of children. Through the explanation above, the use of smartphones for students has an impact on learning time management, so with that researchers are interested in conducting further research on the use of smartphones on the learning time management of grade v students at home. In addition, according to the literature review, few research topics focus on the impact of smartphone use on differentiated learning and learner time management.

## **METHODS**

This research is qualitative. This type of qualitative research is used to obtain in-depth data or data that contains meaning (Sugiyono, 2016). In qualitative research, the data collected is data that explains information or descriptions to obtain valid data. Therefore, according to (Moleong, 2019), the data source of this qualitative research is a display in the form of oral or written words observed by researchers and objects that are observed in detail to obtain implied or explicit meaning in the document or object (Siyoto & Sodik, 2015).

This research utilizes a field research design. In qualitative research, field research is a method for collecting data, with researchers going to the field to observe phenomena scientifically. This type of research approach is descriptive research. Descriptive research is concerned with researching phenomena in more detail or distinguishing them from phenomena. Descriptive research describes current problem-solving based on data (Siyoto & Sodik, 2015). This research was conducted at the MI Bantul Kelompok Kerja Guru (KKG) or Teacher Working Group, or Professional Learning Community (PLC), with 40 members as the research subjects. The data analysis technique of this field research used extensive field notes and then analyzed them to conclude.

## **RESULT AND DISCUSSION**

Mapping learning needs aims for teachers to plan learning that optimizes students' potential or directs learning according to student's interests applied to the learning process and products. In this study, smartphone use was analyzed based on the description of students in the MI Bantul Kelompok Kerja Guru (KKG) school environment. The first step is to carry out observations related to differentiated learning and student learning time management. Furthermore, using smartphones for teachers to support learning was described with interviews and documentary evidence of the learning process. Differentiated learning is described by looking at learning outcomes and analyzing learning products. These two steps will focus on the achievement of the results of analyzing the use of smartphones that support differentiated learning and learner management in each school.

Differentiation learning can be done using content, process, and product differentiation. Students are taught how to differentiate content. Content can be differentiated based on student readiness, interests, learning styles, or a combination of the three (Wahyuni, 2022). The three differentiation strategies carried out with the use of smartphones are as follows:

- 1) Besides preparing various learning resources for learners, content-differentiated education includes reading books, videos, power points, pictures, and the environment of what material is taught to learners. Mapping learners' learning needs and using grouping based on learners' abilities and interests can be done with smartphones. The context of understanding and implementing learning for teachers in groups based on abilities and interests could be more substantial. Teachers have yet to utilize smartphone media as support in grouping students; therefore, it is essential that learning preparation can always involve smartphones as a form of grouping. Teachers' understanding of designing differentiated learning plans using smartphones leads to Problem-Based Learning (Afandi & Handayani, 2020). The challenge faced in preparing various contents aimed at grouping learners is the problem of mastering applications on smartphones.

Examples of learning models designed to be carried out with learning readiness using smartphone content include: a). Access to Learning Resources, learners access various learning resources online, such as e-books, articles, learning videos, and educational websites. b). Offline/online learning applications tailored to the learning theme, c). Collaboration and Communication: Collaborate on group projects and communicate with teachers and classmates through messaging apps, email, or social media platforms. d). Assessment and feedback: Smartphones can be used to conduct formative assessments, where learners can submit assignments, take quizzes, or receive immediate teacher feedback through apps or online learning platforms. e). Self-Directed Learning: Access self-directed learning apps, interactive modules, or online learning platforms to learn materials independently according to ability levels. f). Multimedia and Creativity: Create multimedia content such as videos, presentations, or podcasts demonstrating their understanding of a concept or topic. g). Final evaluation of image and video products, h). Research and Exploration according to the learning theme



Figure 1 Smartphone to perform clustering of content differentiation learning

- 2) Process differentiation refers to how students understand or make meaning of what is learned. Process differentiation can be done with tiered activities, providing guiding questions or challenges that need to be solved in corners of interest, creating individualized agendas for students through to-do lists, varying the time students can take to complete tasks, and developing varied activities. Process differentiation refers to how learners interpret or understand learning through tiered or related activities. Smartphones are used to solve questions that include auditory and visual stimuli. The use of smartphones in the differentiation learning process has been carried out well, but



educators must apply a flow of the use process. The network of each smartphone influences constraints in the length of work time. Tasks and quizzes are completed together according to the grouping of each learner. This model will distinguish between 2 groups that need to get attention or not. For differentiated learning activities in the process phase, teachers can implement them well, but the preparation process takes a long time. This will affect how the management of students in learning. Smartphones are one of the process differentiation learning models that must pay attention to planning, implementation, and evaluation.

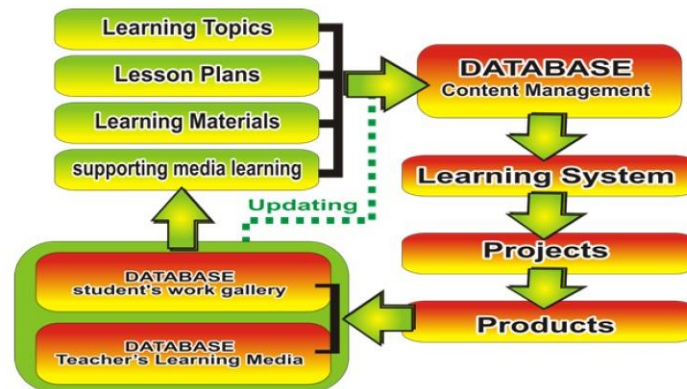


Figure 2 Guidance on the use of smartphones in learning process differentiation

- 3) Product differentiation results from work or performance that students must show the teacher, which can be an essay, speech, recording, diagram, or something that has a form (Herwina, 2021). Product differentiation reflects learners' understanding to realize learning objectives that are expected to be achieved through work or performance assigned by the teacher in the form of essays, performances, project work, articles, presentations, audio transcripts, videos, diagrams, and others. The product differentiation obtained in this study is the existence of learning outcomes that schools use in the form of photos and videos. Learners are successfully directed to have competence in mastering information technology in the form of video creators. This concept gives each group or individual learner freedom to present their learning outcomes according to their interests and abilities. The results of the learner product differentiation phase obtained from interviews are that the concept of using smartphones implemented still needs to invite teachers and learners to actively commit and carry out learning centered on completing the final project.

Learning readiness by educators could be much higher. This is evidenced by the description of learning readiness, which must integrate the process and the final product. In learning readiness, educators must dare to commit to students. They are avoiding monotonous learning and fixating on knowledge contests and memorization. The learning interest of students who show interest in learning with smartphones is shallow if educators cannot provide innovation in the learning process. It is proven that smartphones can be misused to support learning. The use of smartphones in differentiated learning must be adjusted to the learners' learning experience to be provided. The experience of using a smartphone is user-friendly for children but needs assistance and initial agreement. The independent learning process of learners needs to be better established and use smartphones effectively and creatively. The tendency of learners who are asked to learn independently with smartphones can involve loss of

learning and not run well. Cooperation and communication have yet to be well established by learners. Educators who direct learners to be able to make rules or guidelines as a form of smartphone use in learning



Figure 3 Using smartphones to conduct product differentiation learning.

Learning readiness must be significant in implementing differentiated learning. With the readiness built by the educator, we can reach the next stage: the learning process and evaluation of learning products. Misconceptions will occur because there is no proper communication between teachers and learners. Misconceptions can also cause learners to be less creative due to limited inspiration and lack of reference to guide learners to create and achieve learning goals. The implementation of differentiated learning is one of the programs carried out to develop the potential of students, including the development of talents in learning according to the needs of students. However, these efforts have yet to be maximally successful in developing students' smartphone learning. Teachers should understand the application of active learning and differentiation to improve learning.

Active learning is learning where students participate in the learning process by listening to what the teacher says and following the learning objectives (Bonwell & Eison, 2012). This paper, in the form of Best Practice, discusses differentiated learning in the development of 21st-century skills, which include the skills of communication, collaboration, critical thinking and problem-solving, creativity, and innovation (4C) (Indarta et al., 2021).

### Smartphone Use in Learner Management

A smartphone is a tool to facilitate all human needs and activities, so it is trendy and is the choice of various groups, including students, to access information and add insight into lifestyle, communication, and self-existence. Smartphones were initially created to obtain information and communicate easily; in the pandemic, smartphones are beneficial as a center for information and communication at and outside school (Sanjaya, 2009).

As stated by the head of the MI Bantul Kelompok Kerja Guru (KKG), Mr. Mulat Viriyanto:

*"The existence of smartphones will provide a broader learner experience; teachers must have a clear commitment and domain of use. Teachers as puppeteers organize students to be productive according to learning objectives by implementing appropriate smartphone strategies."*

A strategy is a plan that contains a series of activities designed to achieve specific educational goals. Smartphones in educational programs make this device a device that can be used as an alternative in media development (Kitchenham, 1 C.E.). The use of smartphones in education is known as mobile learning (m-Learning) technology. Time management indicators for learners are divided into five, namely: able to set goals, able to prioritize, able to make a schedule, able to minimize distractions, and able to delegate tasks.

### 1. Able to define purpose

Knowing the purpose of using smartphones must be prepared from the beginning at the stage of learning preparation from teachers to students. Smartphones are only used to access the internet or complete assignments, questions, and quizzes based on teacher instructions. The use of internet access can be regulated for whether or not the internet is necessary for learning materials. Learners are directed to respond, create projects, and work on problems that make learning objectives more active, creative, and communicative via smartphones.

Teacher member, Mrs. Annisa Aulia Rahma Al-Anshori of KKG MI Bantul expresses this.

*"Smartphones for elementary school children will greatly add to the learning experience of children, and children love challenges and new things they do not know yet. However, the teacher's readiness, the system that manages the tool, and the agreement with the class. This internet tool is one of many things for elementary schools, sir. So that children are not addicted to cellphones; it is more about practicing assignments and responsibility for sending assignments from the teacher via the cellphone."*

### 2. Able to Develop a Prioritized Schedule

Based on observations, teachers who are members of the Bantul teachers' working group use smartphones as schedulers and reminders for learning. Learners are scheduled to use smartphones according to the learning material to be studied. Learners can only bring smartphones to school if there is a specific learning agenda and theme. With these rules, learners do not violate them and can focus on participating in teaching and learning activities. They also did not violate it because of socialization with student guardians. Teachers apply prioritization of smartphone use by looking at school facilities and students' readiness independently.

Cahya Rizki Saputra, one of the grade 5 educators in the MI Bantul teachers' working group, revealed that:

*"I give a schedule once a month for using smartphones at school and another schedule for project-based homework activities."*

### 3. Able to Make Schedules

Schedule planning is more than organizing activities or distributing tasks for educators or students. Smartphones can be an alarm and reminder to sort out schedules, considered priorities, and routines that must be done. Interviews conducted by 5th-grade teachers at KKG MI Bantul explained that many still need help from parents in directing children to make a schedule for daily routines and learning. Parents are still dominant in determining students' learning management. Teachers will only control children's activities with smartphone assignments scheduled according to students' instructions. For example, in working on assignments given by teachers using smartphones, children still have to be reminded by their parents when to do homework, go to the Koran, and eat and sleep. When children are at school, teachers must make

strict rules regarding the use of smartphones. Only in certain subjects, such as science and cultural arts, do teachers schedule teachers to invite students to access smartphones to see experiments or performances and work according to instructions that are impossible at home due to limited facilities.

#### **4. Able to minimize disruptions**

The results of interviews with several teachers at KKG MI Bantul explained that teachers have tried to involve smartphones in learning activities at school and at home. However, the teacher cannot fully monitor the control of students' learning management. Making rules and agreements at the beginning will teach children to be responsible and stick to the rules when using smartphones. Teachers will directly help learners to be focused on the use of smartphones. Parents play the leading role in directing children to control their use and minimize the distraction of smartphones.

Mr. Safi Nur Rohman explained that some parents have shown that some learners are aware of limiting themselves in using smartphones. Parents who discuss using smartphones that interfere with learning activities directly with teachers are prevented by removing applications that do not support learning, such as addictive games.

#### **5. Able to delegate tasks**

Based on observations made during the direct socialization with KKG MI Bantul, upper-grade learners are always active when teachers give group assignments involving smartphones. Learners happily and enthusiastically follow the teacher's directions and can complete group tasks on time. If the group task has to be completed outside of school hours, learners are assisted by parents to support their children in doing the group task.

Differently, Anindya Revinia Putri, a member of the Bantul MI KKG, revealed that the main priority in completing tasks using smartphones is much better than completing tasks without smartphones. This means that smartphones can improve students' learning management in completing assignments and project materials using smartphones. Students can complete tasks on time when assignments can be taken home.

From the interview results above, learners already know how to manage their time using smartphones. Both through parental assistance, and rules made by parents, there is an initiative to complete assignments early because children will be trusted to use smartphones by their parents. However, parents still limit the use of smartphones. Based on the results of interviews and observations, parents' role is essential in managing students' learning and smartphone time. It can be seen from the interviews of learners who rely heavily on parents to remind them and regulate when they can play on smartphones. Learners still need the help of others in managing themselves, either managing time or organizing daily life. Whereas at school, the teacher becomes the center for regulating and training the use of smartphones more useful and understanding learning management using smartphones to learners. Teachers as control and reminders to improve learners' learning management at school and home. Limits and rules must be made to realize the use of smartphones based on the need.

## **CONCLUSIONS**



The above research results conclude that smartphone media is very influential in learning process activities. Smartphones can support three stages in differentiated learning: content, process, and product differentiation. Differentiation is learning that allows students to increase their potential according to their learning readiness, interests, and learning profiles/styles. Smartphone is one of the media that can support differentiated learning. Smartphones have five indicators that can affect learner learning management, including 1) Able to set goals, 2) Able to set priorities, 3) Able to make a schedule, 4) Able to minimize distractions, and 5) Able to delegate tasks. In its implementation, smartphones become a strategy supporting differentiated learning and learner learning management. Teachers must be able to become masterminds who organize students' learning needs according to their interests and provide guidelines for the use of smartphones from the learning readiness phase, process, product, and learning evaluation so that learning objectives can be achieved in line with the effective and efficient use of smartphones. Future research is expected to continue by looking at the effectiveness of smartphones in differentiated learning to see the novelty of future research.

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### REFERENCES

- Afandi, M., & Hanayani, T. (2020). Penerapan Problem Based Learning (PBL) untuk Meningkatkan Higher Order Thinking Skills (HOTS) Ditinjau dari Hasil Belajar Mahasiswa pada Mata Kuliah Materi IPA MI. *JIP Jurnal Ilmiah PGMI*, 6(1), 88–106. <https://doi.org/10.19109/jip.v6i1.4330>
- Ahmad Susanto. (2013). *Teori Belajar & Pembelajaran di Sekolah Dsaar*. Kencana.
- Amaliyah, A., & Zakhra, A. (2021). Peningkatan Mutu Pendidikan Sebagai Wujud Pengembangan Kompetensi Guru. *COMSERVA Indonesian Journal of Community Services and Development*, 1(2), 32–40. <https://doi.org/10.36418/comserva.v1i2.7>
- Bonwell, C. C., & Eison, J. A. (2012). Active Learning: Creating Excitement in the Classroom. 1991 ASHE-ERIC Higher Education Reports. *ERIC*. <https://eric.ed.gov/?id=ED336049>
- Chusna, P. A. (2017). Pengaruh Media Gadget Pada Perkembangan Karakter Anak. *Dinamika Penelitian: Media Komunikasi Penelitian Sosial Keagamaan*, 17(2), Article 2. <https://doi.org/10.21274/dinamika.2017.17.2.315-330>
- Faiz, A., Pratama, A., & Kurniawaty, I. (2022). Pembelajaran Berdiferensiasi dalam Program Guru Penggerak pada Modul 2.1. *Jurnal Basicedu*, 6(2), Article 2. <https://doi.org/10.31004/basicedu.v6i2.2504>
- Herwina, W. (2021). Optimalisasi Kebutuhan Murid Dan Hasil Belajar Dengan Pembelajaran Berdiferensiasi. *Perspektif Ilmu Pendidikan*, 35(2), Article 2. <https://doi.org/10.21009/PIP.352.10>

- Indarta, Y., Jalinus, N., Abdullah, R., & Samala, A. D. (2021). 21st Century Skills: TVET dan Tantangan Abad 21. *Edukatif: Jurnal Ilmu Pendidikan*, 3(6), 4340–4348. <https://doi.org/10.31004/edukatif.v3i6.1458>
- Kitchenham, A. (1 C.E.). Models for Interdisciplinary Mobile Learning: Delivering Information to Students. In <https://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/978-1-60960-511-7>. IGI Global. <https://www.igi-global.com/book/models-interdisciplinary-mobile-learning/www.igi-global.com/book/models-interdisciplinary-mobile-learning/47404>
- Made, R. K. N. (2022). Penerapan Pembelajaran Berdiferensiasi Model Vak Dengan Multimoda Untuk Meningkatkan Minat Dan Prestasi Belajar Siswa. *Majalah Ilmiah Universitas Tabanan*, 19(1), Article 1.
- Moleong, L. (2019). *Metodologi Penelitian Kualitatif* (PT Remaja Rosda Karya, Ed.).
- Nurrahmaniah, N. (2019). Peningkatan Prestasi Akademik Melalui Manajemen Waktu (Time Management) Dan Minat Belajar. *Andragogi: Jurnal Pendidikan Islam dan Manajemen Pendidikan Islam*, 1(1), Article 1. <https://doi.org/10.36671/andragogi.v1i1.52>
- Sandrawita, E. (2019). *Dampak Negatif Penggunaan Gadget (Handphone) Dalam Pengelolaan Waktu Belajar Anak Usia SMP Di Rt 01 Kelurahan Pelabuhan Baru* [Undergraduate, IAIN Curup]. <http://e-theses.iaincurup.ac.id/271/>
- Sanjaya, W. (2009). *Strategi Pembelajaran: Berorientasi Standar Proses Pendidikan*. Kencana.
- Setiawan, A., Sugiharto, D. Y. P., & Purwanto, E. (2022). Efektivitas Konseling Self Management dalam Mereduksi Problematic Smartphone Use. *Bulletin of Counseling and Psychotherapy*, 4(1), Article 1. <https://doi.org/10.51214/bocp.v4i2.171>
- Siyoto, S., & Sodik, M. A. (2015). *Dasar Metodologi Penelitian*. Literasi Media Publishing.
- Sugiyono. (2016). *Metode Penelitian Kualitatif, Kuantitatif dan R&D*. Alfabeta.
- Tomlinson, C. A. (2001). *How to Differentiate Instruction in Mixed-ability Classrooms*. ASCD.
- Wahidaty, H. (2021). Manajemen Waktu: Dari Teori Menuju Kesadaran Diri Peserta Didik. *EDUKATIF: JURNAL ILMU PENDIDIKAN*, 3(4), Article 4. <https://doi.org/10.31004/edukatif.v3i4.1015>
- Wahyuni, A. S. (2022). Literature Review: Pendekatan Berdiferensiasi Dalam Pembelajaran IPA. *JURNAL PENDIDIKAN MIPA*, 12(2), Article 2. <https://doi.org/10.37630/jpm.v12i2.562>