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Differentiated learning with information technology for teachers at SMA Negeri 5 Padangsidimpuan

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ABSTRACT

Differentiated learning aims to improve classroom learning by accommodating students' diverse personalities and backgrounds, enabling effective and efficient participation. This community service provides training for teachers at SMA Negeri 5 Padangsidimpuan on differentiated learning methods using information technology through a blended learning approach. The training included pre- and post-tests to evaluate teachers' knowledge and skills. Results showed a significant improvement in teachers' ability to use interactive applications such as Padlet, Nearpod, Classcraft, and Kahoot, with post-test scores indicating an average increase of 20% compared to pre-test scores. Statistical analysis using the T-test confirmed the enhancement, with p-values below 0.05 for differentiated learning concepts and application usage. Teachers reported Kahoot as the most preferred application, followed by Padlet, Classcraft, and Nearpod. The study concludes that designing and implementing diverse instructional strategies using interactive media tailored to students' needs fosters meaningful learning experiences and improves teaching outcomes. Future efforts will include sustained support for teachers and the development of technology-focused learning modules.

Keyword: Differentiated Learning, Information Technology, Interactive, Teacher

ABSTRAK

Pembelajaran diferensiasi bertujuan untuk meningkatkan proses pembelajaran di kelas dengan mengakomodasi keragaman kepribadian dan latar belakang siswa, sehingga memungkinkan partisipasi yang efektif dan efisien. Pengabdian masyarakat ini memberikan pelatihan kepada guru di SMA Negeri 5 Padangsidimpuan terkait metode pembelajaran diferensiasi menggunakan teknologi informasi melalui pendekatan blended learning. Pelatihan mencakup pre-test dan post-test untuk mengevaluasi pengetahuan dan keterampilan guru. Hasil menunjukkan peningkatan signifikan dalam kemampuan guru menggunakan aplikasi interaktif seperti Padlet, Nearpod, Classcraft, dan Kahoot, dengan skor post-test meningkat rata-rata 20% dibandingkan skor pre-test. Analisis statistik menggunakan T-test mengonfirmasi peningkatan ini, dengan nilai p di bawah 0,05 untuk konsep pembelajaran diferensiasi dan penggunaan aplikasi. Guru melaporkan Kahoot sebagai aplikasi yang paling disukai, diikuti oleh Padlet, Classcraft, dan Nearpod. Studi ini menyimpulkan bahwa merancang dan menerapkan strategi pembelajaran yang beragam menggunakan media interaktif sesuai kebutuhan siswa dapat meningkatkan pengalaman belajar yang bermakna dan hasil pengajaran. Upaya lanjutan meliputi dukungan berkelanjutan bagi guru dan pengembangan modul pembelajaran berbasis teknologi.

Keyword: Pembelajaran Diferensiasi, Teknologi Informasi, Interaktif, Guru.

1. Introduction

As the primary driving force behind national education, teachers must understand that every child is different. Each child has unique interests, talents, and intellectual abilities influenced by the culture in which they are raised [1]. Thus, possessing good teaching skills is crucial to becoming a teacher, as good learning outcomes are determined by the quality of a good teacher [2].

Determining the appropriate and suitable teaching methods is one way that can be used to enhance teachers' competencies in fostering comprehensive student interest to achieve educational success. Adapting teaching methods can be done through differentiated learning methods.

Differentiated learning is an effort to transform the classroom learning process in meeting each student's learning needs regarding their interests, learning profiles, and readiness to achieve better learning outcomes [3]. Differentiated learning enables teachers to view learning from various perspectives, learn about students, and respond to their learning based on differences. As teachers continue to learn about the diversity of their students, professional, effective, and efficient learning can be achieved [4]. In its implementation, differentiated learning not only emphasizes the execution or learning products but also focuses on the learning process and content. The goal of implementing differentiated learning is to enable students with different personalities and backgrounds to effectively participate in the learning process.

Through differentiated learning, teachers are required to present learning methods that focus more on the characteristics and variations of students as interactive knowledge absorbers. Therefore, guidance and training related to the understanding and introduction of differentiated learning are necessary for teachers, including those at SMA Negeri 5 Padangsidimpuan. Differentiated learning is supported by the use of information technology in the form of interactive learning applications such as Padlet, Nearpod, Classcraft, and Kahoot.

The use of information technology as a supportive tool to manage learning and generate products using appropriate information and communication technology is one of the eight skills that 21st-century students should possess [5]. This also aligns with two goals of achieving Sustainable Development Goals (SDGs): Quality Education by ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all, especially within the environment and scope of SMA Negeri 5 Padangsidimpuan. Furthermore, the SDGs' goal of Decent Work and Economic Growth will also be influenced by enhancing the quality of human resources as a realization of quality education.

2. Methods

The implementation of the guidance and training activities for differentiated learning using technology and face-to-face interaction involved several systematic steps, described in detail as follows:

- Setting Objectives and Targets.

  The initial step involved identifying clear objectives and targets. The main objective was to enhance teachers' understanding and application of differentiated learning methods using information technology. Targets were set to include measurable outcomes such as improved knowledge (evaluated through pre- and post-tests) and the ability to use interactive applications like Kahoot, Padlet, Nearpod, and Classcraft effectively. These objectives were aligned with the broader goals of improving student learning outcomes and teacher competencies.

- Materials and Tools.

  Materials used during the training included:
  - Presentation slides on differentiated learning concepts and blended learning strategies.
  - Instructional videos demonstrating the use of interactive applications.
  - Printed handouts summarizing key points.

  Tools employed in the training included:
  - Laptops or desktop computers for teachers.
  - Projector and screen for presentation delivery.
  - Internet connectivity to access and demonstrate online applications.
  - Pre-prepared accounts for applications such as Kahoot, Padlet, Nearpod, and Classcraft for hands-on practice.

- Needs Analysis.

A needs analysis was conducted to determine the teachers' initial knowledge and skills related to differentiated learning and their familiarity with educational technology tools. This was achieved through surveys and interviews, supplemented by a pre-test consisting of ten questions assessing their baseline competencies.

- Designing Differentiated Learning.

Based on the needs analysis results, the training program was designed to include:

- Theoretical sessions covering the principles and benefits of differentiated learning.
- Practical demonstrations and guided exercises on using technology-based applications to support differentiated instruction.
- A structured sequence of activities blending face-to-face instruction with technology-based learning.

This design considers variations in methods, strategies, and learning materials to accommodate teachers in differentiating their instruction to students. Thus, the pace and level of understanding of each student can be adjusted accordingly. The use of technology becomes a crucial component in the learning design. Teachers can make use of these advancements by employing various technological innovations during the educational process [6]. The subject matter taught can be adapted to innovative learning methods that are currently being developed using information technology-based applications [7]. Some applications that can be used are Kahoot!, Paddelt, Nearpod and Classcraft.

- Implementation of Blended Learning

The training was conducted over two days at SMA Negeri 5 Padangsidimpuan. The activities included:

- Day 1: Pre-test administration, presentation on differentiated learning concepts, and practical training on Padlet and Nearpod.
- Day 2: Training on Classcraft and Kahoot, task assignments for teachers to practice the applications, and post-test administration to evaluate knowledge and skill improvement.

- Evaluation and Development

The evaluation phase involved analyzing the pre- and post-test results, which showed measurable improvements in teachers' knowledge and skills. Usability surveys and task assessments were conducted to gauge the effectiveness of the training. Statistical analysis, specifically T-test calculations, confirmed significant differences in pre- and post-test scores ($p < 0.05$).

- Documentation
- Comprehensive documentation of the training process included:
  - Photographs of the training sessions (e.g., teacher interactions, practical demonstrations).
  - Screenshots of application usage by participants.
  - Pre-test and post-test result records, summarized in tables and charts.
  - Testimonials from participants and feedback collected through surveys.

The structured methodology ensured that the training was effective, interactive, and aligned with the teachers' needs, ultimately enhancing their ability to implement differentiated learning strategies in the classroom.

3. Results and Discussion

The implementation of the outreach activity took place directly for two days at SMA Negeri 5 Padangsidimpuan. A total of 13 participants attended the training, comprising mathematics, Indonesian language, chemistry, history, English, and IT teachers. The first day (Figure 1), on Friday, August 18, 2023, began with administering a pre-test consisting of ten questions (https://bit.ly/pretestSMAN5) to assess the extent of the teachers' knowledge regarding differentiated learning and information technology.

After the completion of the pre-test, the activity continued with the presentation of differentiated learning concept material using a blended learning approach by Sri Melvani Hardi, S.Kom., M.Kom., training on the use of Padlet learning application by Tamir Rusydi Hega, and the use of Nearpod learning application by Yoristedi Prayoga. Question and answer sessions are conducted in each session after the material has been presented.

Figure 1 First day training activities.

The activities on the second day (Figure 2), which was on Saturday, August 19, 2023, continued with training on the use of the Class Craft learning application by Muhammad Said Agung Nasution and the Kahoot application by Ivan Jaya, S.Si., M.Kom, followed by a question and answer session. After all the material was delivered, the teachers were then asked to implement one of the four applications that aligned with each teacher's lesson content. Teachers who presented the material were given a goody bag as a form of reward. In the final stage, a post-test (https://bit.ly/posttestSMAN5) was conducted to assess the improvement in teachers' knowledge and skills after the training was completed.

Figure 2 Second day training activities.

Out of ten questions, there are six questions related to differentiated learning. The results of the pre-test and post-test can be seen in Table 1. By using statistics, specifically the T-test, the results obtained can be seen in Table 2:

Tabel 1 Pre-Test and post-test related to differentiated learning.

	Pre-Test		Post-Test	
Questions	Correct	Not Correct	Correct	Not Correct
Q1	3	10	12	1
Q2	11	2	12	1
Q3	12	1	13	0
Q4	13	0	13	0
Q5	13	0	13	0
Q6	13	0	13	0

Tabel 2 t-Test two-sample assuming equal variances.

	3	*12*
Mean	12.4	12.8
Variance	0.8	0.2
Observations	5	5
Pooled Variance	0.5	
Hypothesized Mean Difference	0	
df	8	
	-	
t Stat	0.894427191	
P(T<=t) one-tail	0.19860192	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.397203841	
t Critical two-tail	2.306004135	

From the results obtained in Table 2, the t-statistic (t Stat) value is smaller than both the one-tail and two-tail critical values. This indicates that there is insufficient evidence to reject the null hypothesis, meaning that no significant difference can be observed between the tested groups at the predetermined level of significance. It can be concluded that teachers at SMA Negeri 5 Padangsidimpuan have mastered the concept of differential learning.

In terms of technological proficiency, teachers from SMA Negeri 5 Padangsidimpuan have shown an improvement in their knowledge and skills. This can be observed from the pre-test and post-test results. During the pre-test, only 5 teachers were familiar with the learning application Kahoot, while other applications such as Padlet, Classcraft, and Nearpod were unknown. Following the post-test, teachers from SMA Negeri 5 Padangsidimpuan were acquainted with and recommended various learning applications, where Kahoot! remained the preferred application, followed by Nearpod, Padlet, and finally Classcraft. The results can be seen in Figure 3.

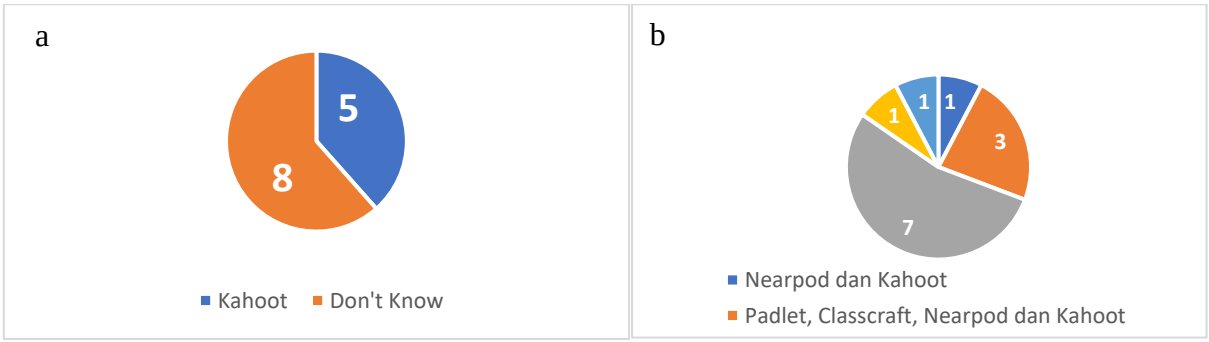

Figure 3 (a) Pre-Test and (b) Post-Test related to known learning applications.

At the end of the training, the Vice Principal of SMA Negeri 5 Padangsidimpuan (Rumini Sukarwati, S.Pd, M.Si) gave closing remarks regarding the successful completion of the two consecutive days of service activities, which undoubtedly enhanced the teachers' knowledge of differentiated learning and the applications that can be used to meet the diverse needs of students. The community service team, represented by the team leader, presented a plaque memento to SMA Negeri 5 Padangsidimpuan (Figure 4).

Figure 4 Group photo with the community service team and partners.

4. Conclusions

The positive response from partners towards this community service activity is due to it addressing one of the issues faced by the partners. This community service initiative serves as a solution for partners to resolve existing problems. Through training in using learning applications, it provides a reference for knowledge and skills related to differentiated learning for teachers to address classroom learning issues by adapting and utilizing available information technology. The follow-up to this community service activity in the future includes ongoing assistance regarding integrated learning methods, development of learning modules that focus on technology, cooperation with schools to evaluate long-term impacts.

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