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Prospective Teachers' Perspectives On Differentiated Instruction in Mathematics

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Abstract.*The pursuit of inclusive mathematics instruction requires educators to adopt adaptive teaching approaches, with differentiated instruction (DI) emerging as a key component. This study explores how future mathematics teachers perceive DI, especially regarding their grasp of its core principles, confidence in instructional application, preparedness to implement, and perspectives on its advantages and obstacles. Employing a descriptive quantitative access, data were collected through a 50-item Likert-scale questionnaire administered to 25 mathematics education students from three universities in Indonesia. The findings affirm comprehensive favorable attitudes toward DI, with mean scores ranging between 3.98 and 4.01. Respondents advertised strong theoretical comprehension of DI and showed enthusiasm about integrating it into their teaching practices. However, challenges such as limited instructional time and deficient firsthand experience in crafting differentiated lessons were acknowledged. These acumen highlight the importance of assimilation more practical, experience-based training within teacher education programs to equip future educators for implementing inclusive and differentiated teaching effectively.*

Keywords: *Differentiated learning; Inclusive mathematics education; Teaching preparation*

Abstrak.Pendidikan matematika yang inklusif menuntut guru untuk menerapkan strategi pembelajaran yang responsif, di mana pembelajaran berdiferensiasi (differentiated instruction/DI) memiliki peran penting. Penelitian ini bertujuan untuk mengeksplorasi persepsi calon guru matematika terhadap DI, dengan fokus pada pemahaman konseptual, kepercayaan diri dalam mengajar, kesiapan implementasi, serta manfaat dan tantangan yang dirasakan. Penelitian ini menggunakan pendekatan kuantitatif deskriptif dengan melibatkan 25 mahasiswa tingkat akhir program studi pendidikan matematika dari tiga universitas di Indonesia. Data dikumpulkan melalui kuesioner tertutup berisi 50 butir pernyataan skala Likert. Hasil analisis menunjukkan bahwa peserta memiliki persepsi positif terhadap DI, dengan skor rata-rata berkisar antara 3,98 hingga 4,01. Peserta menunjukkan pemahaman yang baik terhadap konsep DI dan ketertarikan yang tinggi untuk mengimplementasikannya di kelas mereka kelak. Meskipun demikian, hambatan praktis seperti keterbatasan waktu dan kurangnya pengalaman langsung dalam merancang pembelajaran berdiferensiasi masih menjadi tantangan. Temuan ini menekankan pentingnya dukungan pelatihan yang lebih praktis dan terfokus dalam program pendidikan guru.

Kata kunci: Kesiapan mengajar; Pembelajaran berdiferensiasi; Pendidikan matematika inklusif

1. BACKGROUND

Differentiated Instruction (DI) has become increasingly recognized as a key approach in today's educational landscape, especially in mathematics instruction, where differences in students' abilities, prior knowledge, and learning speed pose ongoing instructional difficulties. DI offers a groundworkugh which teachers can adapt instructional content, processes, and

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outcomes to suit individual learner profiles better, thus promoting inclusive, student-centered classrooms (Smale-Jacobse et al., 2019).

However, despite its academic promise, implementing DI in accurate teaching contexts remains irregular, particularly for preservice teachers who often lack comprehensive exposure and practice opportunities during their training (Brevik, Blikstad-Balas, & Engelien, 2018; Muhammad & Iqbal, 2020). In many teacher preparation programs, DI is only outwardly covered, which results in a preparedness gap that block the ability to apply its principles confidently and effectively in classroom settings (Handa, 2020; Smets & Struyven, 2020).

Research conducted across various educational systems has revealed varying degrees of DI understanding among preservice teachers. For instance, Bal (2016) observed that although DI strategies were linked to improved learning outcomes in algebra, teacher candidates often faced difficulties translating theory into practice. Likewise, Aftab (2015) highlighted that although trainee teachers recognized the value of DI, practical barriers—like insufficient time and lack of demonstrated teaching models—limited their use of it in practice. Melesse (2015) also noted that, in the Ethiopian context, DI implementation was often superficial due to conceptual ambiguity and minimal institutional backing.

Taken together, these findings expose a persistent and global disconnect between DI as taught in theory and how it is applied in classrooms by emerging educators.

2. THEORETICAL REVIEW

Although discussions surrounding Differentiated Instruction have gained momentum in educational literature, there is still a notable shortage of quantitative research that specifically investigates preservice mathematics teachers. Much of the current literature either blends findings across multiple subject areas or employs qualitative and mixed-methods approaches, which can restrict the clarity and transferability of the data (Siam & Al-Natour, 2016; Lindner, Eitel, & Kuehl, 2019). Additionally, the majority of existing DI research focuses on experienced, in-service teachers, leaving early-stage teacher beliefs underexplored (Pozas, Letzel, & Schneider, 2020).

Lai, Wang, and Lei (2020) emphasized that preservice training is a formative stage during which future teachers build instructional habits and develop their self-efficacy. Despite this, many teacher education programs do not take in DI comprehensively into their curricula, resulting in hollow or disjointed understandings among future educators.

In response to this research gap, the present study employs a quantitative methodology to examine how preservice mathematics teachers perceive and prepare to integrate DI into their

teaching. Rather than focusing solely on obstacles or theoretical endorsement, this study investigates the crossing of teacher candidates' beliefs, self-assessed competence, instructional intentions, and their actual training experiences. It also considers how the structure of teacher education programs and the broader sociocultural setting shape these perceptions.

The central objective is to assess preservice mathematics teachers' levels of awareness, confidence, and preparedness regarding DI implementation. By mapping approaching patterns and uncovering critical areas of weakness, the study aims to offer consequential contributions for curriculum designers, teacher educators, and policy makers striving to augment the quality and depth of DI instruction in teacher education.

3. RESEARCH METHODOLOGY

This study adopted a descriptive quantitative method, employing a structured questionnaire to explore how final-year mathematics teacher candidates perceive and prepare for the application of Differentiated Instruction (DI) within the scope of their academic training.

Participants and Setting: The research involved 25 preservice mathematics teachers from three universities in Indonesia. This whole stratified random sampling technique was used to ensure correct and balanced representation. The study was conducted over three months, from February to April 2025.

Instrument and Data Gathering: Data were collected using a validated questionnaire becoming from previous literature on DI implementation (e.g., Aftab, 2015; Handa, 2020; Pozas, Letzel, & Schneider, 2020). The survey was divided into four sections: participant demographics, conceptual knowledge of DI, perceived confidence and readiness, and perceived implementation challenges. Responses were sawtooth using a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The mechanism underwent adept review to ensure content validity and achieved strong internal consistency, with a Cronbach's alpha of 0.89.

Procedures**:** The survey was disseminated digitally through a secure online system. Before participation, briefed consent was obtained, and all respondents were assured of confidentiality and anonymity.

Data Processing and Analysis**:** Descriptive statistics were used to summarize trends in responses. Inferential analyses—such as independent-sample t-tests and one-way ANOVA—were employed to examine differences in perceptions based on gender, institutional context,

and prior experience with DI. Pearson's correlation was used to assess the relationship between self-reported confidence and willingness to adopt DI practices.

4. RESULT AND DISCUSSION

The analysis was based on the responses of 25 future mathematics educators to a 50-item Likert-type questionnaire, which covered four primary themes: Conceptual Understanding, Instructional Confidence, Readiness and Implementation, and Perceived Benefits and Barriers.

Table 1. Summary of Perception Scores by Dimension (N=25)

NO.	Dimension	Mean	Std.Deviation
1.	Conceptual Understanding	3.99	0.82
2.	Intructional Confidence	3.98	0.82
3.	Readiness and Implementation	4.00	0.81
4.	Perceived Benefits and Barriers	4.01	0.81

The results show consistently high ratings across all dimensions, with the highest mean score seen for Perceived Benefits and Barriers (M = 4.01, SD = 0.81), indicating a strong recognition of the value and practical significance of DI. The mean combination around 4.0 indicates a generally positive sentiment among respondents.

A mean of 3.99 for Conceptual Understanding reflects a solid grasp of core DI principles—such as aligning instruction with students' readiness levels, interests, and learning styles—echoing findings from earlier studies (Brevik et al., 2018; Smale-Jacobse et al., 2019).

The slightly lower score in Instructional Confidence (M = 3.98) suggests a modest variation in how confident participants feel in forging DI methods. This may reflect differences in practicum experience and instructional exposure (Handa, 2020; Muhammad & Iqbal, 2020).

Participants reported strong Readiness and Implementation levels (M = 4.00), suggesting a willingness to adopt DI strategies. However, this readiness does not always take the form of action due to fundamental constraints, an arrangement financed by Siam & Al-Natour (2016).

Despite the generally positive outlook, challenges remain. Time limitations, lack of instructional models, and insufficient support structures continue to hinder implementation. Yuen et al. (2023) argued that post-COVID educational adjustments—such as greater planning demands and digital access gaps—have made DI even more complicated to practice. Additionally, systemic constraints like rigid assessments and administrative pressures (Education Sciences, 2022) contribute to these challenges.

Many participants cited a lack of opportunities for real-world practice with DI. This boosts actual research emphasizing the need for practical exposure, mentorship, and scaffolded instruction (Lai et al., 2020). Rijal et al. (2024) further noted that DI improves mathematical achievement and problem-solving abilities, which likely contributes to the optimism observed in this study. A late meta-analysis (2025) also highlighted that DI amplifies student stimulant and self-regulation, particularly when supported by continuous professional development.

These findings underscore the necessity of integrating DI training into both preservice and ongoing professional learning. As noted by Yuen et al. (2023), the ultimate of DI pretence in its flexibility to technological change and educational crises.

Inferential analysis revealed a statistically significant correlation between favorable perceptions of DI and higher instructional confidence. However, no significant correlation was found between confidence levels and actual willingness to implement DI. This suggests that environmental or contextual factors—such as teaching experience or support systems—may play a greater role in implementation decisions.

High ratings in Perceived Benefits and Barriers resonate with Subban's (2006) argument that DI enhances learner motivation, and Tomlinson's (2014) assertion that teacher sensitivity to learner diversity increases DI usage. Research by Holloway (2021) and Chamberlin & Powers (2010) supports the view that both theoretical foundation and practical modeling are crucial during preservice training.

Regarding Readiness and Implementation, the findings align with Rock et al. (2008), who approved for the REACH model in DI training, and with scholars like Santangelo & Tomlinson (2009) and Heacox (2012), who emphasized simulated teaching and microteaching as valuable tools. Further, Coubergs et al. (2017) and Valiandes & Neophytou (2018) stressed the importance of institutional scaffolding in mixing the gap between theory and classroom practice.

In conclusion, while participants show strong theoretical understanding and positive feeling toward DI, the study emphasizes the need for immersive training, guided practice, and systemic support to enable meaningful implementation of differentiated teaching strategies.

CONCLUSION AND SUGGESTIONS

This research reveals that future mathematics educators generally acquire a constructive perspective on differentiated instruction (DI), demonstrating both an understanding of its foundational concepts and an openness to applying them across mixed teaching contexts. The evidence points to an appreciation of DI as a meaningful approach to accommodating diverse

student needs and promoting fairness in mathematics learning. Participants' reflections advice they value both the theoretical relevance and classroom potential of DI. However, disparities in their expressed confidence and preparedness indicate inconsistencies in how teacher training programs equip them. While the participants showed ambition and a positive attitude, many also voiced uncertainty about executing DI without guided support, underscoring a disconnection between knowledge and firsthand implementation.

In light of these insights, it is desirable that teacher education programs embed more firsthand, evidence-informed DI experiences within their training frameworks. Prospective teachers would benefit greatly from opportunities to observer, apply, and critically evaluate DI practices in authentic classroom climate. Such experiences are key to closing the gap between theory and practice while fostering instructional self-assurance. It is equally important to acknowledge the real-world constraints—such as limited time and varied school conditions—that may pose challenges to DI adoption. Hence, any support initiatives must be grounded in realistic teaching scenarios.

Despite its addition, this study is strained by a limited participant pool and the exclusive use of self-reported data, which may not fully reflect actual instructional act or sustained attitudes. To build a more robust understanding of DI in teacher development, future investigations should involve deep and more heterogeneous samples, integrate classroom observations, and examine the abiding effects of DI-focused training on instructional practices. These efforts will provide deeper insights into how differentiated instruction can be effectively cultivated during the early stages of teacher preparation.

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