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Teacher Engagement as a Multidimensional Construct: Insights From a Measurement Model Analysis

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Abstract: This study aims to evaluate teacher engagement as a multidimensional, reflective construct comprising four dimensions: academic support, emotional support, guidance support, and assessment support. This study employed a quantitative approach with a survey design using cluster sampling across four public senior high schools. A total of 1.359 eleventh-grade students from four public senior high schools in Pekanbaru participated by completing a 24-item questionnaire, which was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). This study used a reflective–reflective hierarchical component model, in which both the first-order dimensions and the second-order teacher engagement construct were specified as reflective. The results indicate that all indicators exhibited outer loading values above 0.70, and each dimension met the criteria for internal reliability and convergent validity, with an average variance extracted (AVE) of 0.573–0.639. Discriminant validity was also established based on the Fornell–Larcker criterion and the HTMT ratio. At the higher-order level, teacher engagement demonstrated excellent reliability, despite the AVE value being below the conventional threshold, a common outcome in reflective hierarchical models. All four dimensions contributed significantly to the higher-order construct, with emotional support emerging as the dominant component. These findings highlight that teacher engagement in the Indonesian context is perceived as a multidimensional phenomenon strongly shaped by teachers' emotional and instructional support. The measurement model developed in this study provides a solid foundation for future research and the development of interventions to enhance teaching quality in schools.

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Introduction

Teacher engagement has become one of the most prominent constructs in educational research over the past two decades (Han & Wang, 2021; Zhang, 2021). As expectations for high-quality learning continue to rise, schools are increasingly required not only to provide relevant curricula but also to ensure that teachers effectively fulfill their instructional and pedagogical roles. In this context, teacher engagement is often regarded as a foundational element in creating productive learning environments, particularly because engaged teachers have been shown to enhance students' motivation, participation, and academic achievement. Numerous studies also report that teacher engagement is associated with improved academic performance, reduced behavioral problems, and stronger teacher–student relationships (Hofkens & Pianta, 2022a; L. Li et al., 2022; Tao et al., 2022a).

Growing attention to teacher engagement is further driven by evidence indicating that its influence extends beyond short-term learning outcomes to shaping school climate and promoting students' socio-emotional development. Engaged teachers tend to be more

Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

responsive to individual student needs, more consistent in providing instructional support, and more capable of building warm and meaningful interactions (Amerstorfer & Freiin von Münster-Kistner, 2021a; Hofkens & Pianta, 2022b). Longitudinal studies have shown that teacher engagement may influence students' academic self-confidence, their perceptions of competence, and even their character development (Yang et al., 2022). These findings affirm that teacher engagement is not merely a technical indicator of teaching quality but an integral part of pedagogical relationships that shape the learnng process over time (Granero-Gallegos et al., 2022; Ji, 2021)

Despite its importance, teacher engagement is not a single, easily defined construct. A wide body of literature suggests that it is a complex phenomenon encompassing cognitive, emotional, and interpersonal processes that unfold in daily classroom interactions (Xie & Derakhshan, 2021). Early studies primarily emphasized teachers' psychological attributes, such as enthusiasm, energy, and vitality, thus conceptualizing teacher engagement as an internal state inherent to the individual (Ji, 2021). However, this perspective has since been criticized for failing to adequately capture how students experience teachers' presence and support during learning (Miao et al., 2022; Roefs et al., 2021).

In response to these limitations, a growing conceptual shift has reframed teacher engagement as a multidimensional construct manifested through various forms of support that teachers provide to students. The literature consistently identifies four core dimensions: academic support, emotional support, guidance support, and assessment support (Roefs et al., 2021; Romano et al., 2021). These dimensions represent a comprehensive scope of teachers' roles, ranging from helping students master subject matter to fostering empathetic relationships and providing developmental guidance, as well as offering constructive feedback. Accordingly, teacher engagement is increasingly understood not as a personal trait but as a set of observable practices directly experienced by students (Hofkens & Pianta, 2022b).

Although this multidimensional perspective has gained broad theoretical support, empirical efforts to validate the structural dimensions of teacher engagement remain limited. Many studies continue to rely on composite scores without examining whether the underlying dimensions function as distinct factors (Y. Wang et al., 2025; Zhou et al., 2024). As a result, conceptual clarity is often blurred, and different aspects of engagement may be unintentionally conflated. Even in countries where teacher engagement instruments have been tested using confirmatory factor analysis, the results are not always consistent, especially when instruments are applied across diverse populations and cultural contexts.

These limitations become more pronounced when considering the role of cultural context in shaping students' perceptions of teacher support. In Indonesia, teacher-student relationships are strongly influenced by social norms emphasizing respect for teachers, collectivistic orientations, and the teacher's role as a moral guide. Such cultural expectations can shape how students interpret teacher behavior and the support they receive. Therefore, instruments developed in other countries cannot be assumed to function identically in the Indonesian context, as differences in meaning, expectations, and classroom interaction norms may lead to variations in how teacher engagement is perceived.

Beyond conceptual and cultural issues, methodological challenges also warrant attention. Many previous studies rely on measurement models that assume linear and homogeneous relationships among indicators, making them less sensitive to the hierarchical and context-dependent nature of teacher engagement (Skaalvik & Skaalvik, 2023; Y. Wang & Pan, 2023). Most examinations of engagement have used covariance-based confirmatory factor analysis (CFA), which requires normally distributed data and relatively stable factor

Vol. 11, No. 4 : December 2025
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pp. 1457-1466
Email: jklppm@undikma.ac.id

structures. In practice, however, student perception data often exhibit substantial variability, non-normal distributions, and reflective relationships among dimensions.

These conditions necessitate more flexible analytical methods that are well-suited to the characteristics of educational data. In this regard, Partial Least Squares Structural Equation Modeling (PLS-SEM) is particularly appropriate because it allows researchers to evaluate reflective constructs in greater detail, is less sensitive to non-normality, and can effectively accommodate multidimensional measurement models with numerous indicators. PLS-SEM is suitable for complex reflective–reflective hierarchical models, can accommodate non-normal data, and is ideal for models with many indicators. Unlike CFA, it provides more stable estimates for hierarchical component models. PLS-SEM also provides a comprehensive set of outputs, including reliability, convergent validity, and discriminant validity, that support the rigorous empirical verification of the teacher engagement construct (Demir & Uşak, 2025). Grounded in these considerations, the present study aims to evaluate teacher engagement as a multidimensional construct, focusing on four dimensions of teacher support: academic, emotional, guidance, and assessment support, as perceived by senior high school students. By employing PLS-SEM, this study seeks to establish the validity and reliability of the teacher engagement measurement model within the Indonesian educational context. This study offers a unique contribution to the literature by providing the first empirically validated multidimensional measurement model of teacher engagement specifically developed for Indonesian high school students. Although teacher engagement has been widely examined in Western contexts, validated instruments tailored for non-Western, collectivistic educational systems are extremely limited.

Research Method

This study employed a quantitative approach with a survey design to evaluate the measurement structure of teacher engagement as a multidimensional construct. The analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), a method well-suited for reflective models involving multiple indicators and hierarchical constructs at both the first- and second-order levels. PLS-SEM also enables comprehensive evaluation of indicator reliability, internal consistency, convergent validity, and discriminant validity, making it appropriate for empirically verifying the theoretical structure of teacher engagement.

The participants consisted of eleventh-grade students from four public senior high schools (SMAN) in Pekanbaru, Indonesia. A cluster sampling technique was employed, in which four public senior high schools (SMAN) in Pekanbaru served as naturally occurring clusters. All eleventh-grade students within these selected schools were included using total cluster sampling. This approach was chosen because the schools represented intact groups, and sampling entire clusters ensured adequate representation of the population. A total of 1.412 students took part in the data collection phase. Through data screening procedures, 53 respondents were excluded due to invalid response patterns, particularly those who assigned identical scores to all questionnaire items. Such response behavior is considered nonrepresentative of genuine perceptions and may distort model estimation accuracy. Consequently, 1.359 valid responses were retained for analysis, meeting the recommended sample size requirements for PLS-SEM in multidimensional reflective models. The sample size exceeded the recommended threshold based on the 10-times rule (10 × the largest number of indicators pointing to a construct), as well as the minimum sample size requirements for PLS-SEM models with medium effect sizes (Wagner & Grim, 2023; Kock, & Hadaya, 2018).

Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

The instrument used in this study was a teacher engagement questionnaire consisting of 24 items. These items were developed based on four theoretical dimensions commonly identified in the teacher engagement literature: academic support (AS), emotional support (ES), guidance support (GS), and assessment support (AsS). Each dimension was measured using six indicators. All items were rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Several items were negatively worded and therefore required reverse coding prior to analysis.

The academic support dimension captures teachers' efforts to help students understand subject matter, provide guidance during learning difficulties, and offer additional learning resources. The emotional support dimension includes indicators related to empathy, care, motivation, and students' sense of being valued. Guidance support reflects various forms of direction, advice, demonstrations, and scaffolding provided by teachers to help students develop academic self-understanding. The assessment support dimension evaluates the quality of feedback, the fairness of evaluation, and how the assessment is used to support students' learning improvement. Prior to data collection, the instrument underwent expert review by two education scholars to ensure its content appropriateness in the Indonesian school context.

Data were collected directly at the participating schools through coordination with school administrators and homeroom teachers. Each class was scheduled for a 30-minute questionnaire session. The researcher explained the purpose of the study, participants' confidentiality rights, and the voluntary nature of participation. All data were collected anonymously to protect participant identity. Questionnaires were completed in classrooms under the supervision of the research team, ensuring that the data obtained were complete and reliable.

Data analysis was conducted using SmartPLS 4.0. The evaluation of the measurement model was performed in two stages: at the dimension level (first-order) and at the construct level (second-order). At the first-order level, each dimension of teacher engagement was assessed for indicator reliability, internal consistency reliability, and convergent validity. Indicator reliability was assessed through outer loading values, with a threshold of 0.70 or higher. Internal consistency was evaluated using Cronbach's Alpha and Composite Reliability (CR), with acceptable values above 0.70. Convergent validity was assessed via Average Variance Extracted (AVE), using the minimum cutoff of 0.50.

Discriminant validity was assessed through two approaches: the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). Discriminant validity is considered satisfactory when the square root of the AVE of each construct exceeds its correlations with other constructs, and when HTMT values remain below the conservative threshold of 0.85. All dimensions met these criteria. At the second-order level, teacher engagement was modeled as a reflective higher-order construct composed of the four dimensions. Consistent with hierarchical modeling guidelines, the evaluation of the higher-order construct did not rely solely on the aggregated AVE value. Because AVE for higher-order constructs tends to be lower due to interdimensional variability, the assessment emphasized the validity evidence at the first-order level and the loading values of each dimension onto the higher-order construct.

Results and Discussion

The measurement model structure of teacher engagement analyzed in this study is illustrated in Figure 1. The diagram presents the four core dimensions, namely academic support (AS), emotional support (ES), guidance support (GS), and assessment support (AsS),

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Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index
Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

as reflective components of a higher-order construct. The visual representation indicates that all indicators contribute positively to their respective dimensions, and that the four dimensions collectively account for the broader construct of teacher engagement. This model serves as the starting point for understanding how students' perceptions of different forms of teacher support are empirically organized.

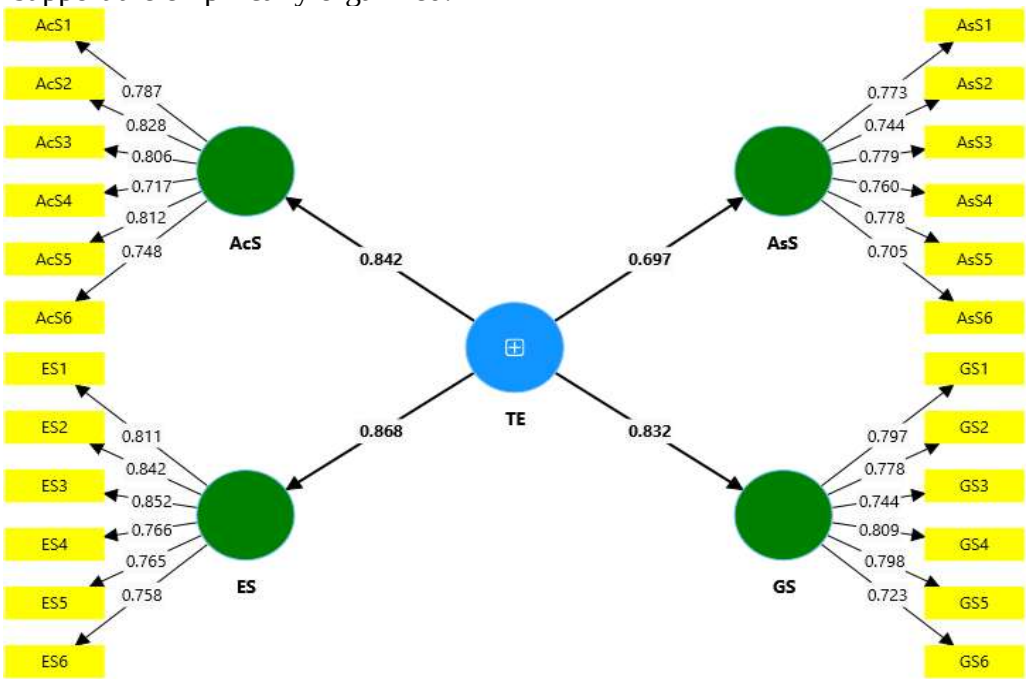

Figure 1. Measurement Model of Teacher Engagement

The initial findings regarding the quality of the indicators are presented in Table 1, which shows that all indicators have outer loading values above 0.70. This indicates that each questionnaire item serves as a strong representation of the dimension it is intended to measure. Psychometrically, this finding is important because it demonstrates that the indicators are not only relevant in terms of content but also statistically robust in capturing their respective latent constructs.

Table 1. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (rho_A)	Composite Reliability (rho_C)	Average Variance Extracted (AVE)
Academic Support	0.874	0.878	0.905	0.615
Assessment Support	0.853	0.869	0.889	0.573
Emotional Support	0.887	0.890	0.914	0.639
Guidance Support	0.868	0.874	0.900	0.601
Teacher Engagement	0.933	0.938	0.940	0.400

The AVE values for the four dimensions ranged from 0.573 to 0.639, indicating that more than half of the variance in each dimension's indicators was explained by its underlying latent construct. In other words, each dimension demonstrates sufficient internal cohesiveness to be treated as a well-defined block of indicators. The internal reliability values, both Cronbach's Alpha and Composite Reliability, were also in the high category. In particular, the Composite Reliability values, which ranged from 0.889 to 0.914, show that the items within each dimension function consistently in measuring their respective latent phenomena. In the context of multidimensional measurement, high reliability at the dimension level is crucial because these dimensions also serve as secondary indicators for the higher-order

Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

construct. When first-order reliability is strong, the hierarchical model has a solid foundation for meaningful interpretation.

After establishing the strength of the indicators, we further examined whether the dimensions were empirically distinct from one another. The results of discriminant validity testing are presented in Tables 2 and 3, using two complementary approaches: the Fornell–Larcker criterion and the HTMT ratio.

Table 2. Fornell–Larcker Criterion

Construct	Academic Support	Emotional Support	Guidance Support	Assessment Support
Academic Support	0.784	0.698	0.560	0.431
Emotional Support	0.698	0.800	0.618	0.437
Guidance Support	0.560	0.618	0.776	0.518
Assessment Support	0.431	0.437	0.518	0.757

In Table 2, it is evident that the square root of the AVE for each construct is higher than its correlations with all other constructs. This pattern indicates that although the dimensions are related, each captures a distinct aspect of students' experiences. For example, Academic Support has a diagonal value of 0.784, which is higher than its correlation with Guidance Support (0.560). This suggests that while providing academic guidance may be associated with helping students understand the material, students still perceive these two forms of support as different kinds of teacher engagement.

Table 3. HTMT Ratio for Discriminant Validity

Construct	Academic Support	Emotional Support	Guidance Support	Assessment Support
Academic Support	—	0.785	0.626	0.474
Emotional Support	0.785	—	0.687	0.477
Guidance Support	0.626	0.687	—	0.588
Assessment Support	0.474	0.477	0.588	—

The HTMT results in Table 3 further strengthen the findings of this study. With HTMT values ranging from 0.474 to 0.785, all coefficients fall below the conservative threshold of 0.85. This indicates that none of the dimension pairs exhibit excessive overlap. Conceptually, this is crucial: when HTMT values approach 1.00, it suggests that two dimensions are essentially indistinguishable. In the present study, however, the separation among dimensions is clearly evident. Students are able to differentiate when teachers help them understand the material (AS), when teachers provide emotional support (ES), when they offer academic direction or learning strategies (GS), and when they deliver feedback or evaluation (AsS).

Interestingly, although the four dimensions function empirically as distinct constructs, they remain interconnected as reflections of a single, higher-order construct: teacher engagement. This is demonstrated by the reliability of the higher-order construct, which shows a Cronbach's Alpha of 0.933 and a Composite Reliability of 0.940, indicating exceptionally strong cohesion. The AVE value for the higher-order construct (0.400) falls below the conventional threshold of 0.50; however, in reflective–reflective hierarchical models, this is not a methodological weakness but rather a consequence of interdimensional variability. AVE values at the higher-order level typically decrease when first-order dimensions are related yet represent different content domains. Therefore, the interpretation of the higher-order construct is best based on the strength of the loadings of each dimension onto the overarching teacher engagement construct.

The dimensional loadings reveal a theoretically and contextually meaningful pattern. The emotional support dimension makes the strongest contribution to teacher engagement

Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

(approximately 0.86), indicating that students' perceptions of teacher engagement are significantly influenced by emotional aspects (Amerstorfer & Freiin von Münster-Kistner, 2021b; Tao et al., 2022b). Teachers who are attentive, empathetic, respectful, and motivating are perceived not merely as good teachers but as genuinely engaged (Minott, 2022; Tang, 2025). In Indonesia's relational educational culture, where respect, care, and nurturing roles are highly valued, the dominance of this dimension is entirely reasonable. Numerous studies have demonstrated that positive emotional interactions enhance student motivation, strengthen academic self-confidence, and promote a psychologically safe classroom climate, all of which contribute to students' perceptions of teacher engagement (Al-Hassan et al., 2025; Romanovska & Novak, 2024; Zhou et al., 2024).

The strong contributions of academic support and guidance further affirm the central role of teachers as primary academic resources in Indonesian schools(Herawati et al., 2024). Unlike educational contexts where students learn more independently, Indonesian students often rely heavily on teachers for direction, guidance, and conceptual clarification (Hasanah et al., 2022). It is therefore unsurprising that these two dimensions show substantial loadings. When teachers explain material clearly, provide learning strategies, and assist students in solving academic challenges, their academic engagement becomes highly salient in students' perceptions (Amerstorfer & Freiin von Münster-Kistner, 2021b; Hofkens & Pianta, 2022c; Tao et al., 2022b).

Conversely, assessment support shows the lowest contribution (approximately 0.70). The relatively lower contribution of the assessment support dimension may reflect the distinctive nature of assessment practices in Indonesian secondary schools. Assessment in Indonesia is predominantly summative and often tied to high-stakes consequences, such as school rankings, graduation requirements, and placement decisions. As a result, students tend to associate assessment more with formal evaluations and numerical outcomes rather than with formative feedback intended to guide their learning progress. Moreover, classroom feedback practices in Indonesia frequently focus on correctness or task completion, with less emphasis on individualized, developmental comments that help students understand their strengths and areas for improvement. When assessment is perceived as evaluative rather than supportive, students may not view it as a central form of teacher engagement, which explains its comparatively lower loading in the measurement model. This pattern aligns with numerous studies indicating that assessment is often perceived by students as a formal and administrative process (Skaalvik & Skaalvik, 2023; Tao et al., 2022b). Emotional interaction and instructional guidance tend to play a more prominent role in shaping students' perceptions of teacher engagement compared to evaluative activities (P.-H. Li et al., 2024; X. Wang et al., 2024; Zheng, 2021). Nonetheless, the contribution of this dimension remains significant, underscoring that constructive and objective feedback remains an essential part of how students understand teacher engagement.

These findings also have important implications for classroom climate and student learning. The strong influence of emotional and academic support suggests that engaged teachers foster a classroom climate characterized by psychological safety, warmth, and responsiveness, conditions known to enhance students' motivation, persistence, and cognitive engagement. The prominent role of guidance support suggests that teachers who provide clear learning strategies and personalized direction can enhance students' self-regulated learning skills. By contrast, the relatively lower contribution of assessment support reflects the high-stakes and summative nature of assessment in Indonesian schools, which may limit the extent to which students perceive feedback as a relational or supportive component of teacher engagement.

Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
Email: jklppm@undikma.ac.id

Conclusion

This study provides empirical evidence that teacher engagement is a multidimensional construct consisting of four forms of teacher support: academic support, emotional support, guidance support, and assessment support. These four dimensions were shown to be valid and reliable representations of students' experiences in their interactions with teachers. The measurement model analysis demonstrated that all indicators exhibited strong reflective properties, while the convergent and discriminant validity tests confirmed that each dimension captures a distinct yet complementary aspect of teacher engagement. At the higher-order level, teacher engagement emerged as a stable reflective structure, with all dimensions contributing significantly to the overarching construct. Emotional support was identified as the most dominant component, indicating that students perceive teacher engagement not only through academic assistance but, more importantly, through warm emotional connections, moral support, and personal attention from teachers.

Recommendation

Based on the findings of this study, efforts to enhance teacher engagement should adopt a comprehensive approach that emphasizes not only instructional practices but also teachers' ability to build warm and supportive emotional relationships with students. Schools should strengthen their professional development programs, focusing on socio-emotional competencies, effective learning guidance strategies, and more objective and constructive formative assessment practices. Given that all four dimensions of teacher engagement contribute significantly, albeit with varying strengths, school-level interventions should maintain a balanced emphasis on academic, emotional, guidance, and assessment-related support.

Several concrete actions can be implemented by schools and teacher development programs to strengthen each dimension of teacher engagement. For academic support, schools may introduce training modules on differentiated instruction, scaffolding techniques, and effective explanation strategies. These modules can be complemented by peer-observation cycles and collaborative lesson study sessions that allow teachers to refine their instructional clarity and responsiveness. For emotional support, teacher training can incorporate socio-emotional learning workshops, empathy-building exercises, and relationship-building routines such as daily check-ins, warm greetings, and restorative classroom practices. Schools may also adopt structured mentoring systems in which experienced teachers model emotionally attuned communication for novice teachers.

To strengthen guidance support, schools can implement programs in academic advising, goal-setting methodologies, and study skills coaching, enabling teachers to guide students in becoming more self-regulated learners. Workshops on learning pathways, problem-solving guidance, and personalized learning conferences may further enhance this dimension. For assessment support, professional development can include modules on formative assessment cycles, constructive verbal and written feedback, rubric-based evaluation, and student–teacher feedback conferences

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Vol. 11, No. 4 : December 2025
E-ISSN: 2442-7667
pp. 1457-1466
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