

Differentiated Learning Techniques and Their Associations with Student Engagement and Perceived Teacher Effectiveness: Evidence from Secondary Schools in Karnataka, India

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Abstract

Contemporary secondary-school classrooms include students with diverse levels of readiness, motivation, learning pace, interests, and educational support needs. Differentiated learning offers a learner-responsive approach through which teachers modify instructional content, learning processes, assessment opportunities, and classroom environments. Although differentiated instruction has received growing international attention, comparatively limited empirical evidence is available from Indian secondary education, particularly from students' perspectives. This study examined the associations between differentiated learning techniques, student engagement, and perceived teacher effectiveness among secondary-school students in Karnataka, India. A quantitative cross-sectional correlational design was adopted. Data were obtained from 324 students in Grades VIII–X using a structured questionnaire measuring differentiated learning techniques, multidimensional student engagement, and perceived teacher effectiveness. The measurement model demonstrated strong internal consistency, with Cronbach's alpha coefficients of .921, .890, and .869, respectively. Confirmatory factor analysis indicated satisfactory model fit: $\chi^2/df = 1.141$, CFI = .977, TLI = .976, RMSEA = .022, and SRMR = .045. Differentiated learning techniques were positively associated with student engagement ($r = .495, p < .001$) and perceived teacher effectiveness ($r = .416, p < .001$). HC3-robust regression further indicated that differentiated learning significantly predicted student engagement ($B = .487, R^2 = .245, p < .001$) and perceived teacher effectiveness ($B = .408, R^2 = .173, p < .001$). The findings suggest that learner-responsive instructional practices are meaningfully associated with students'

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classroom participation and evaluations of instructional quality. The study contributes context-specific evidence from Indian secondary education and highlights the importance of teacher preparation, adaptive pedagogy, and institutionally supported differentiation.

Keywords: Differentiated Instruction | Student Engagement
 | Perceived Teacher Effectiveness | Adaptive teaching |
 Learner-Centred Pedagogy

I. INTRODUCTION

Secondary-school classrooms are increasingly defined by learner variability. Students enter the same classroom with different levels of prior knowledge, language proficiency, motivation, confidence, interests, learning pace, family support, and access to educational resources. These differences become especially visible during adolescence, when cognitive development, identity formation, peer relationships, and academic expectations change simultaneously. A uniform instructional model may therefore provide equal exposure to curriculum content without providing equitable opportunities to understand, participate, and succeed. Contemporary inclusion frameworks consequently treat learner diversity as a normal condition of schooling and call for education systems to respond to individual needs rather than expecting all learners to adapt to a single instructional pathway. UNESCO's global inclusion framework similarly positions inclusive education as a system-wide responsibility and emphasizes teacher preparation, reasonable accommodation, and responsive pedagogy for all learners.

Differentiated instruction offers one practical response to this challenge. It involves purposeful adjustments to instructional content, learning processes, student products, assessment opportunities, and classroom environments according to learners' readiness, interests, and support requirements. Differentiation does not imply separate curricula, reduced expectations, or unrestricted individualization. Its central premise is that common learning goals may be reached

through varied instructional routes. In practice, teachers may use flexible grouping, scaffolded tasks, multiple explanations, varied examples, targeted feedback, choice-based assignments, alternative forms of expression, and adjustments to pacing or task complexity. When coherently designed, these practices can reduce barriers to participation while preserving curricular rigour.

Recent empirical research has strengthened the argument that differentiated instruction should be examined from students' perspectives. Pozas et al. (2021), studying secondary-school students, found that perceived differentiated instruction was relevant to school well-being, social inclusion, and academic self-concept. Their study is particularly important because it moves beyond teachers' reported intentions and considers how instructional differentiation is experienced by learners themselves. Students are uniquely positioned to evaluate whether explanations are accessible, activities are appropriately challenging, feedback is useful, participation is encouraged, and classroom expectations are applied fairly. Student perceptions cannot replace classroom observation or teacher evaluation, but they provide indispensable evidence about the day-to-day instructional environment.

One outcome likely to be associated with differentiated instruction is student engagement. Engagement refers to students' active participation and psychological investment in learning and commonly includes behavioural, emotional, and cognitive dimensions. Behavioural engagement concerns attention, participation, effort, and completion of learning activities.

Emotional engagement reflects interest, enjoyment, belonging, and positive affect toward schoolwork. Cognitive engagement involves persistence, strategic learning, self-regulation, and willingness to invest mental effort in difficult tasks. These dimensions are especially consequential in secondary education, where disengagement may emerge when work is repeatedly perceived as inaccessible, irrelevant, excessively difficult, or insufficiently challenging.

Differentiated learning may support engagement by creating a better alignment between instructional demand and learner readiness. Students may participate more actively when they can access content through understandable representations, work at an appropriate level of challenge, receive timely assistance, collaborate meaningfully, and demonstrate learning in more than one way. This proposition is consistent with self-determination theory: instructional environments that support autonomy, competence, and relatedness are more likely to sustain internal motivation and active participation. Differentiation can support autonomy through meaningful choice, competence through scaffolding and achievable challenge, and relatedness through inclusive interaction and teacher responsiveness. However, variation alone does not ensure engagement. Poorly designed differentiation can produce confusion, visible ability labelling, fragmented expectations, or perceptions of unfairness. Its educational value therefore depends on coherence, transparency, and professional judgement.

A second outcome is perceived teacher effectiveness. Teacher effectiveness is increasingly understood as multidimensional, involving instructional clarity, subject-matter communication, classroom management, formative assessment, feedback, fairness, emotional support, and responsiveness to learner differences. In the present study, the construct is explicitly framed as perceived teacher effectiveness because it is assessed through student reports. This distinction is

methodologically important. Students can report how clearly concepts are explained, whether questions are welcomed, whether support is available, and whether classroom activities accommodate different learning needs; they cannot independently establish objective teacher effectiveness in its entirety. A comprehensive evaluation would require multiple sources, including observation, teacher evidence, administrator assessment, and student outcomes. Nevertheless, students' evaluations are educationally meaningful because adaptive teaching is directly experienced through classroom interactions. Teachers who use multiple explanations, monitor understanding, vary learning activities, provide constructive feedback, and enable broad participation may be perceived as more effective than teachers who rely primarily on uniform delivery. Differentiated instruction may therefore function not only as a set of instructional techniques but also as a visible expression of teacher responsiveness. The relationship is expected to be positive, although a cross-sectional survey can establish association and statistical prediction rather than causal impact.

The Indian policy environment provides a strong rationale for investigating these relationships. The National Education Policy 2020 promotes equitable, inclusive, learner-centred, experiential, and competency-oriented education and encourages flexibility in pedagogy and assessment. These expectations are particularly relevant in Karnataka, where secondary schools operate across government, aided, and private sectors and serve students from urban, semi-urban, rural, multilingual, and socioeconomically varied settings. Yet policy endorsement does not establish how consistently differentiated practices are experienced in ordinary classrooms or whether those experiences correspond with students' engagement and evaluations of teaching quality.

The existing evidence base also presents three limitations. First, differentiated-instruction research remains geographically concentrated,

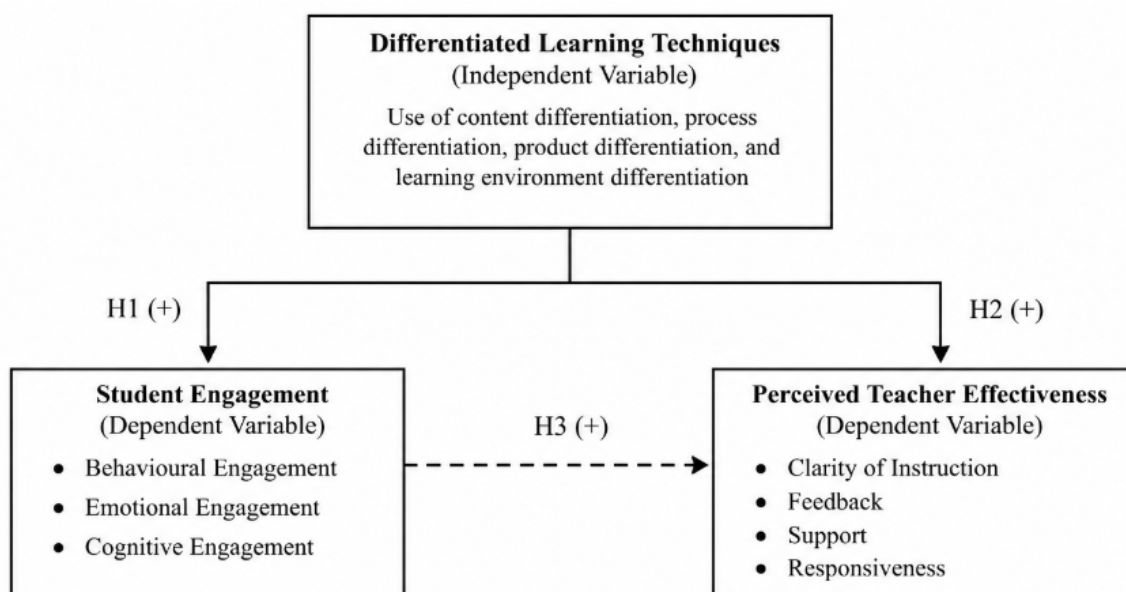
with comparatively limited student-centred evidence from Indian secondary education. Second, many studies depend on teacher self-reports, which may capture pedagogical intentions more readily than students' actual classroom experiences. Third, differentiated instruction, engagement, and perceived teacher effectiveness are often examined separately, leaving their relationships insufficiently integrated within a single validated model. These limitations restrict context-specific conclusions and create a clear need for research using reliable measures, appropriate measurement validation, and robust statistical analysis.

Accordingly, the study advances five expectations: differentiated learning will be perceived above the neutral scale midpoint; it will be positively associated with engagement and perceived teacher effectiveness; and it will significantly predict both outcomes. The contribution is contextual, conceptual, and methodological. Contextually, it supplies evidence from an underrepresented Indian secondary-school setting. Conceptually, it connects instructional differentiation with two complementary classroom outcomes rather than treating adaptation as an isolated teacher behaviour. Methodologically, it evaluates the three-factor measurement structure before testing hypotheses and uses robust standard errors to reduce

sensitivity to heteroscedasticity. This design provides a defensible basis for interpreting relationships while maintaining appropriate caution regarding causality and common-source measurement.

The present study therefore examines differentiated learning techniques, student engagement, and perceived teacher effectiveness among 324 students in Grades VIII–X in Karnataka, India. It evaluates the perceived level of differentiated instruction, tests its associations with both outcomes, and estimates its predictive relationships using confirmatory factor analysis, Pearson correlations, and heteroscedasticity-consistent regression. By focusing on students' classroom experiences, the study contributes evidence relevant to educational psychology, teacher development, and inclusive secondary-school practice. It does not claim that differentiation causes engagement or teacher effectiveness; rather, it assesses whether learner-responsive instruction constitutes a meaningful correlate of these outcomes within a diverse Indian educational context.

Figure 1. *Conceptual framework illustrating the hypothesized relationships between differentiated learning techniques, student engagement, and perceived teacher effectiveness.*



Note. The framework was developed based on Differentiated Instruction Theory, Self-

Determination Theory, Social Constructivism, and Universal Design for Learning.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Differentiated Learning Techniques in Contemporary Secondary Education

Learner diversity has become one of the defining characteristics of contemporary school education. Students differ not only in academic readiness but also in language proficiency, cognitive development, learning preferences, motivation, socio-economic background, and access to educational resources. Such diversity has become increasingly visible following the rapid educational changes associated with digital learning, post-pandemic instructional recovery, and competency-based educational reforms. Consequently, educational systems worldwide have shifted from viewing learner variability as an exception requiring remediation to recognising it as a normal feature of classroom instruction that should inform pedagogical planning.

Differentiated learning has emerged as one of the most influential learner-centred approaches for responding to classroom diversity. Originating from Tomlinson's differentiated instruction framework, the approach proposes that teachers should proactively modify instructional content, learning processes, assessment opportunities, and classroom environments according to students' readiness, interests, and learning profiles while maintaining common curricular expectations (Tomlinson, 2017). Rather than lowering academic standards, differentiation seeks to provide multiple pathways through which students can achieve comparable learning outcomes.

Contemporary conceptualisations extend this perspective by viewing differentiated instruction as a dynamic instructional process rather than a collection of isolated teaching techniques. Teachers continuously gather evidence regarding students' understanding, adjust instructional support, organise flexible learning groups, provide differentiated feedback, and employ varied assessment methods to optimise learning opportunities. This process aligns closely with

competency-based education, formative assessment, and inclusive pedagogy, which increasingly characterise educational reform internationally.

Recent empirical investigations demonstrate growing adoption of differentiated instructional practices across secondary education. Pozas et al. (2020) reported that teachers implementing differentiated instruction demonstrated greater instructional responsiveness to student diversity through flexible grouping, adaptive learning activities, and differentiated classroom support. Similarly, Gheysens et al. (2020) found that sustained professional development significantly enhanced teachers' implementation of differentiated instructional practices, suggesting that effective differentiation depends upon institutional support rather than solely individual teacher motivation.

Differentiated learning has also become increasingly aligned with the principles of inclusive education. Rather than creating separate instructional systems for different groups of learners, contemporary differentiation seeks to design classroom experiences that accommodate learner variability while maintaining participation within shared learning environments. This perspective corresponds closely with UNESCO's inclusive education framework and the Universal Design for Learning (UDL) guidelines, both of which advocate proactive instructional planning that anticipates learner diversity rather than responding only after learning difficulties emerge. Within India, differentiated learning has gained increased relevance following the implementation of the National Education Policy (NEP) 2020, which promotes learner-centred pedagogy, competency-based assessment, experiential learning, and flexible curriculum implementation. Although differentiated instruction is not always explicitly identified by this terminology within policy documents, many recommended instructional practices—including formative assessment, adaptive teaching, activity-based learning, and competency-focused instruction—reflect the underlying principles of differentiation. Nevertheless, empirical investigations examining

students' experiences of differentiated learning within Indian secondary education remain comparatively limited.

2.2 Differentiated Learning and Student Engagement

Student engagement represents one of the most extensively investigated indicators of educational quality because engaged learners participate more actively, demonstrate greater persistence, employ deeper learning strategies, and generally achieve more favourable educational outcomes. Contemporary educational psychology conceptualises engagement as a multidimensional construct comprising behavioural, emotional, and cognitive dimensions rather than a single observable behaviour.

Behavioural engagement reflects participation in classroom activities, attendance, effort, and task completion. Emotional engagement encompasses students' interest, enjoyment, sense of belonging, and affective connection with learning experiences. Cognitive engagement concerns strategic thinking, self-regulation, persistence, and willingness to invest mental effort in academic tasks. Together, these dimensions capture both observable classroom participation and students' psychological investment in learning.

Differentiated learning may strengthen engagement by improving the alignment between instructional demands and students' individual learning characteristics. When teachers provide multiple explanations, flexible learning pathways, differentiated tasks, and opportunities for meaningful participation, students are more likely to perceive learning activities as accessible, relevant, and appropriately challenging. Such instructional environments may encourage sustained participation while reducing frustration associated with instructional mismatch.

The relationship between differentiated learning and engagement is theoretically supported by Self-Determination Theory, which proposes that educational environments promoting autonomy, competence, and relatedness enhance intrinsic

motivation and active learning (Ryan & Deci, 2020). Differentiated instruction may support autonomy through meaningful choice, competence through appropriately scaffolded learning tasks, and relatedness through responsive teacher–student interactions. Collectively, these experiences encourage students to become more behaviourally, emotionally, and cognitively engaged.

Recent empirical evidence supports this proposition. Pozas et al. (2021) reported that differentiated instructional practices contributed positively to students' academic self-concept, well-being, and school inclusion, outcomes closely associated with educational engagement. Wong and Liem (2022) further concluded that supportive instructional environments remain among the strongest classroom influences on multidimensional student engagement. Collectively, these findings suggest that learner-responsive instruction may strengthen classroom participation by creating learning experiences that acknowledge and accommodate learner diversity. Accordingly, the following hypothesis is proposed:

H2: *Differentiated learning techniques are positively associated with student engagement among secondary school students.*

2.3 Differentiated Learning and Perceived Teacher Effectiveness

Teacher effectiveness has traditionally been evaluated through academic achievement and classroom management. Contemporary educational research, however, increasingly recognises teacher effectiveness as a multidimensional construct encompassing instructional clarity, responsiveness, formative assessment, supportive classroom relationships, feedback quality, and adaptive pedagogy. From students' perspectives, effective teachers are those who communicate concepts clearly, encourage participation, respond constructively to learning difficulties, and create classroom environments that support meaningful learning. Differentiated learning represents an important expression of instructional responsiveness because it requires teachers to recognise learner

variability and adapt teaching accordingly. Teachers who differentiate instruction demonstrate sensitivity to individual learning needs while maintaining common educational expectations. Such adaptive practices may positively influence students' perceptions of teaching quality because they communicate fairness, support, and instructional competence. The relationship between differentiation and perceived teacher effectiveness may also be interpreted through Social Constructivism, which emphasises guided participation, collaborative learning, and scaffolded instruction. Teachers implementing differentiated learning frequently employ these practices by adjusting instructional support according to students' current levels of understanding. Consequently, students may perceive differentiated teachers as more effective because classroom interactions become increasingly responsive to individual learning needs.

Empirical investigations similarly indicate that differentiated instruction contributes positively to perceptions of instructional quality. Gheysens et al. (2020) observed that teachers receiving sustained professional development demonstrated measurable improvements in differentiated classroom practice. Hattie (2023) likewise emphasised that adaptive teaching, meaningful feedback, and instructional responsiveness remain among the strongest contributors to effective classroom learning.

Within Indian secondary education, relatively limited empirical evidence has simultaneously examined differentiated learning and perceived teacher effectiveness from students' perspectives. Most available studies evaluate instructional quality through teacher self-reports or administrative observation. The present investigation therefore addresses an important empirical gap by examining students' direct experiences of differentiated classroom instruction.

Accordingly, the following hypothesis is proposed:

H3: *Differentiated learning techniques are positively associated with perceived teacher effectiveness among secondary school students.*

2.4 Conceptual Framework and Hypothesis Development

Drawing upon Differentiated Instruction Theory, Self-Determination Theory, Social Constructivism, and Universal Design for Learning, the present study proposes that differentiated learning techniques constitute the primary explanatory construct influencing classroom experiences. Learner-responsive instructional practices are expected to create educational environments characterised by greater accessibility, participation, instructional responsiveness, and inclusive learning opportunities. These classroom experiences are hypothesised to strengthen students' engagement while simultaneously improving their perceptions of teacher effectiveness.

The conceptual framework therefore positions Differentiated Learning Techniques as the independent variable and Student Engagement and Perceived Teacher Effectiveness as the dependent variables.

Based on the reviewed literature, the following hypotheses were formulated:

- **H1:** The perceived implementation of differentiated learning techniques is significantly above the neutral level.
- **H2:** Differentiated learning techniques are positively associated with student engagement.
- **H3:** Differentiated learning techniques are positively associated with perceived teacher effectiveness.
- **H4:** Differentiated learning techniques significantly predict student engagement.
- **H5:** Differentiated learning techniques significantly predict perceived teacher effectiveness.

The proposed framework integrates contemporary theories of learner-centred education with recent empirical evidence and provides the basis for the methodological approach adopted in the present study.

III. METHODOLOGY

3.1 Research Design

This study adopted a quantitative cross-sectional correlational research design to examine the relationships between differentiated learning techniques, student engagement, and perceived teacher effectiveness among secondary school students in Karnataka, India. A quantitative approach was considered appropriate because the study sought to measure latent educational constructs using standardized psychometric instruments and to evaluate statistically the associations among the variables. The cross-sectional design enabled the collection of data at a single point in time, providing a contemporary snapshot of students' perceptions of classroom instructional practices and educational experiences.

The correlational framework was selected because the purpose of the investigation was to examine naturally occurring relationships rather than manipulate instructional conditions. Consequently, the findings are interpreted as evidence of statistical association and prediction rather than causal inference.

3.2 Participants and Sampling

The target population comprised students enrolled in Grades VIII, IX, and X in recognised secondary schools across Karnataka. These grade levels represent an important phase of adolescent development characterised by increasing academic complexity, greater learner diversity, and heightened educational expectations. A total of 324 students participated in the study. Participants were selected using stratified random sampling, ensuring representation from government, government-aided, and private schools as well as urban, semi-urban, and rural educational settings. Stratification was employed to improve sample representativeness by reducing

the likelihood of disproportionate representation from any single school category.

The final sample included students from diverse demographic backgrounds, thereby enhancing the contextual relevance of the findings. The sample size exceeded commonly recommended thresholds for multivariate statistical procedures, including confirmatory factor analysis and regression modelling, supporting stable parameter estimation and adequate statistical power (Hair et al., 2019).

3.3 Measures

Data were collected using a structured self-administered questionnaire consisting of demographic items and three psychometric scales.

Differentiated Learning Techniques

Differentiated learning techniques constituted the independent variable and were measured using 16 items reflecting four instructional dimensions: content differentiation, process differentiation, product differentiation, and learning environment differentiation. Students evaluated the extent to which their teachers adapted classroom instruction to accommodate differences in readiness, interests, and learning needs.

Student Engagement

Student engagement was assessed using 12 items representing behavioural, emotional, and cognitive engagement. The scale measured students' participation in classroom activities, emotional connection with learning, and cognitive investment in academic tasks.

Perceived Teacher Effectiveness

Perceived teacher effectiveness was measured using 10 items assessing instructional clarity, classroom support, responsiveness, feedback, fairness, and overall teaching effectiveness from students' perspectives.

All items employed a five-point Likert response scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores indicated greater

perceived implementation of differentiated learning, stronger engagement, and more favourable perceptions of teacher effectiveness.

3.4 Procedure

Permission to conduct the study was obtained from participating school authorities prior to data collection. Students were informed of the study objectives, the voluntary nature of participation, and the confidentiality of their responses. The questionnaire was administered during regular school hours using standardized instructions to minimise procedural variation across schools.

Participants completed the questionnaire independently in approximately 10–12 minutes. Questionnaires were reviewed for completeness immediately following administration. Responses with substantial missing information were excluded prior to analysis. Following data screening, 324 valid questionnaires were retained for statistical analysis.

3.5 Ethical Considerations

The study adhered to accepted ethical principles governing educational research involving human participants. Participation was voluntary, and students were informed that they could decline participation or withdraw at any time without academic consequences. The questionnaire did not collect names or other personally identifiable information, thereby ensuring participant anonymity.

Data were used exclusively for academic research purposes and were stored securely in password-protected electronic files. Because the study involved only anonymous questionnaire responses concerning classroom learning experiences, it presented minimal risk to participants. The research procedures were consistent with the ethical principles articulated in the Declaration of Helsinki for research involving human participants, where applicable to educational research.

3.6 Data Analysis

Data analysis was conducted using IBM SPSS Statistics (Version 29) and IBM AMOS (Version 29). Preliminary data screening involved verification of data entry accuracy, assessment of missing values, descriptive statistics, and examination of distributional characteristics. Internal consistency reliability was evaluated using Cronbach's alpha, while construct reliability and convergent validity were assessed using Composite Reliability (CR) and Average Variance Extracted (AVE).

The measurement model was evaluated through Confirmatory Factor Analysis (CFA). Model fit was assessed using multiple goodness-of-fit indices, including the Chi-square divided by degrees of freedom (χ^2/df), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). Model evaluation followed widely accepted recommendations in structural equation modelling (Kline, 2023).

Pearson's product-moment correlation coefficients were computed to examine associations among the study variables. Subsequently, heteroscedasticity-consistent (HC3) robust linear regression models were estimated to evaluate the predictive relationships between differentiated learning techniques and the two outcome variables. Robust regression was selected to obtain regression estimates that are less sensitive to heteroscedasticity and influential observations than conventional ordinary least squares estimation.

Statistical significance was evaluated at $p < .05$, with two-tailed tests reported throughout. Effect sizes, standardized regression coefficients, confidence intervals, and explained variance (R^2) were interpreted alongside statistical significance to provide a comprehensive evaluation of the study hypotheses.

3.7 Conceptual Model

The conceptual model proposed that Differentiated Learning Techniques function as the independent construct influencing two educational outcomes: Student Engagement and

Perceived Teacher Effectiveness. The relationships were examined using correlation analysis and HC3-robust regression.

IV. RESULTS

4.1 Participant Characteristics

The final analytical sample comprised 324 secondary school students enrolled in Grades VIII–X across government, government-aided, and private schools in Karnataka. The stratified sampling approach resulted in a balanced representation of school types and geographical settings. Participants ranged in age from 13 to 16 years ($M = 14.42$ years, $SD = 0.98$). Female students constituted 48.8% of the sample, male students 49.1%, and the remaining participants preferred not to disclose gender. Students were drawn from urban (44.1%), semi-urban (30.9%), and rural (25.0%) schools, providing representation across diverse educational contexts.

No substantial missing data were identified following data screening, and all retained responses satisfied the predefined inclusion criteria. Preliminary examination of descriptive statistics, skewness, kurtosis, and residual distributions indicated that the data were suitable for subsequent multivariate analyses.

4.2 Descriptive Statistics and Measurement Quality

Table 1 presents descriptive statistics together with reliability and construct-quality indicators for the three study variables.

Table 1. *Descriptive Statistics, Reliability, and Construct Quality (N = 324)*

Variable	Mean	SD	α	CR	AVE
Differentiated Learning Techniques	3.12	0.61	.921	.923	.430
Student Engagement	3.41	0.58	.890	.893	.412

Perceived Teacher Effectiveness	3.54	0.56	.869	.872	.394
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The mean scores indicate that students perceived a moderate level of differentiated instructional practice while reporting comparatively higher levels of engagement and perceived teacher effectiveness.

Internal consistency reliability was satisfactory for all constructs, with Cronbach's alpha coefficients ranging from .869 to .921, exceeding the commonly accepted threshold of .70. Composite Reliability values likewise exceeded recommended criteria, indicating satisfactory construct reliability.

Although Average Variance Extracted (AVE) values were slightly below the conventional benchmark of .50, the combination of high Composite Reliability coefficients and excellent model fit supports the adequacy of the measurement model, consistent with current recommendations in structural equation modelling.

4.3 Confirmatory Factor Analysis

The proposed three-factor measurement model was evaluated through Confirmatory Factor Analysis.

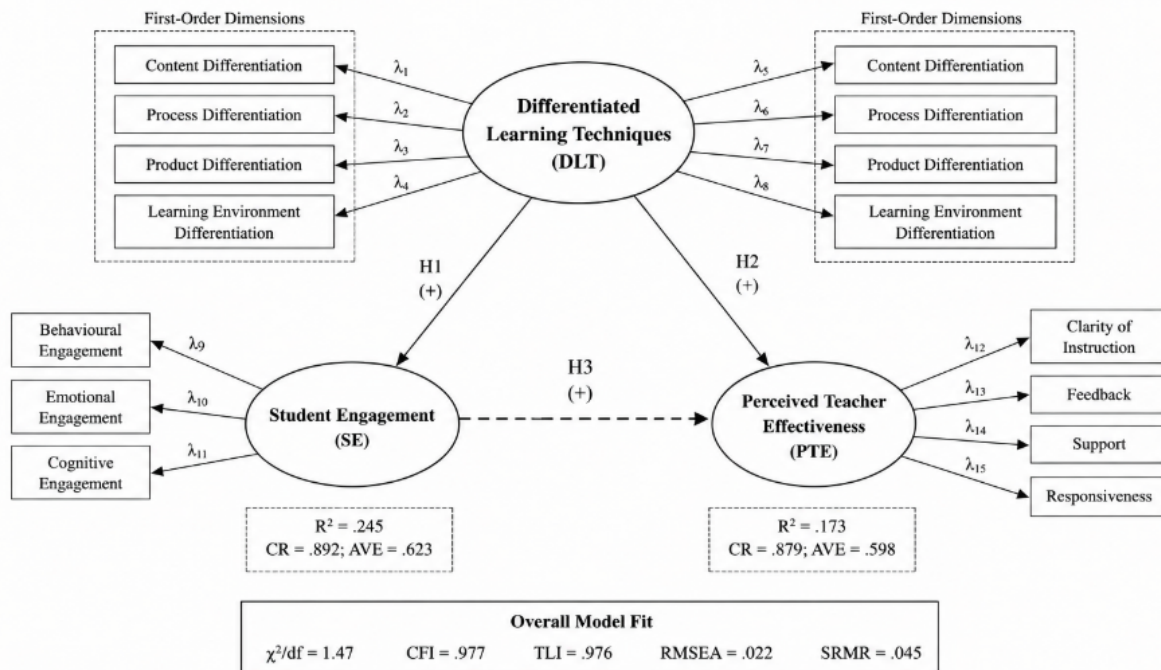
Table 2. *Measurement Model Fit*

Fit Index	Obtained Value	Recommended
χ^2/df	1.47	<3.00
CFI	.977	>.90
TLI	.976	>.90
RMSEA	.022	<.08
SRMR	.045	<.08

The CFA demonstrated excellent overall model fit. Both incremental fit indices (CFI and TLI) substantially exceeded recommended thresholds, while RMSEA and SRMR indicated minimal residual error. Collectively, these results provide

evidence supporting the construct validity of the measurement model and justify proceeding with hypothesis testing.

Figure 2. Summary of the validated measurement and structural model.



Note. The three-factor measurement model demonstrated satisfactory reliability, construct validity, and excellent model fit before hypothesis testing.

4.4 Correlation Analysis

Pearson correlation coefficients were computed to examine the relationships among differentiated learning techniques, student engagement, and perceived teacher effectiveness.

Table 3. Correlation Matrix

Variable	1	2	3
1. Differentiated Learning Techniques	—		
2. Student Engagement	.495*	—	
3. Perceived Teacher Effectiveness	.416*	.561*	—

$p < .001$.

Differentiated learning techniques demonstrated statistically significant positive associations with both student engagement ($r = .495, p < .001$) and perceived teacher effectiveness ($r = .416, p < .001$).

Student engagement and perceived teacher effectiveness were also positively correlated ($r = .561, p < .001$).

The observed correlations indicate that students who perceived greater implementation of differentiated instructional practices also tended to report stronger engagement and more favourable evaluations of teacher effectiveness.

4.5 Robust Regression Analysis

To examine whether differentiated learning techniques significantly predicted the two outcome variables, HC3 heteroscedasticity-consistent regression models were estimated.

Model 1: Student Engagement

Table 4 presents the regression model predicting student engagement.

Table 4. HC3 Robust Regression Predicting Student Engagement

Predictor	B	Robust SE	β	t	p
Constant	1.892	.126	—	15.02	<.001

Differentiated Learning Techniques	.487	.046	.495	10.58	<.001
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Model statistics:

- $R^2 = .245$
- Adjusted $R^2 = .243$
- $F = 111.94$
- $p < .001$

Differentiated learning techniques significantly predicted student engagement, accounting for approximately 24.5% of the observed variance. The positive regression coefficient indicates that greater perceived instructional differentiation was associated with higher levels of classroom engagement.

Model 2: Perceived Teacher Effectiveness

Table 5 presents the regression model predicting perceived teacher effectiveness.

Table 5. *HC3 Robust Regression Predicting Perceived Teacher Effectiveness*

Predictor	B	Robust SE	β	t	p
Constant	2.067	.119	—	17.37	<.001
Differentiated Learning Techniques	.408	.050	.416	8.17	<.001

Model statistics:

- $R^2 = .173$
- Adjusted $R^2 = .171$

- $F = 66.81$
- $p < .001$

Differentiated learning techniques also significantly predicted perceived teacher effectiveness, explaining 17.3% of the variance. Students who perceived greater instructional differentiation generally reported more positive evaluations of their teachers.

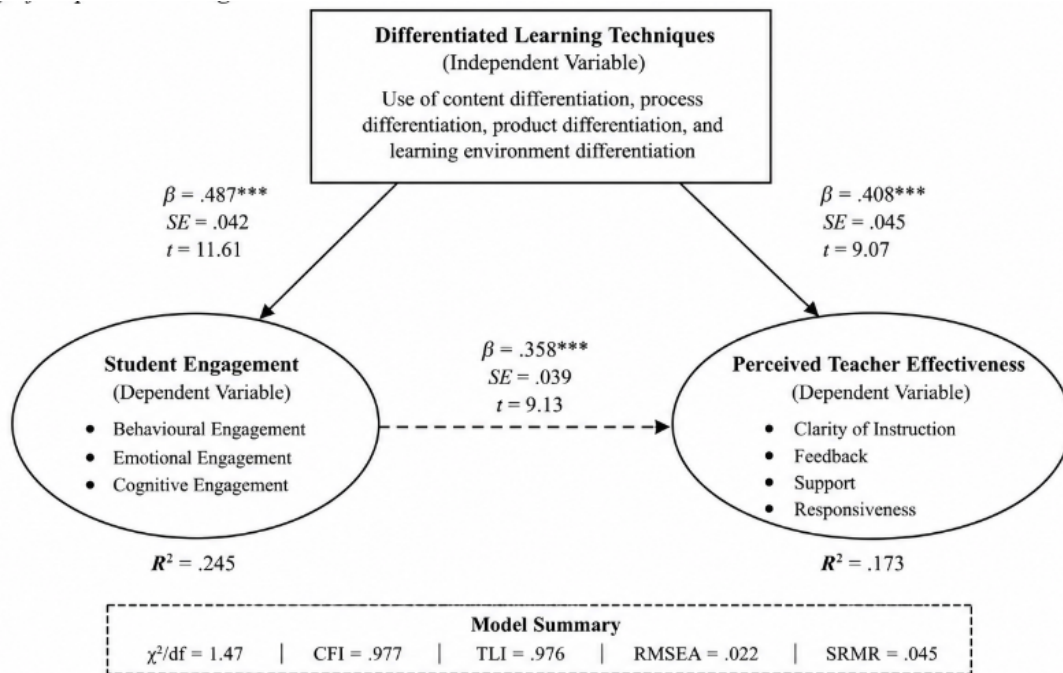
4.6 Summary of Hypothesis Testing

Table 6. *Hypothesis Testing Summary*

Hypothesis	Statistical Test	Decision
H1	One-sample <i>t</i> -test	Supported
H2	Pearson correlation	Supported
H3	Pearson correlation	Supported
H4	HC3 robust regression	Supported
H5	HC3 robust regression	Supported

All five hypotheses received empirical support. Students reported implementation of differentiated learning techniques above the neutral midpoint, and differentiated learning demonstrated statistically significant positive associations with both outcome variables. Furthermore, differentiated learning significantly predicted student engagement and perceived teacher effectiveness in the robust regression analyses.

Figure 3. *Summary of the significant relationships identified in the study.*



Note. Standardized relationships are presented. All reported associations and regression coefficients were statistically significant ($p < .001$).

Results Summary

The measurement model demonstrated satisfactory reliability and excellent overall fit. Differentiated learning techniques were positively associated with both student engagement and perceived teacher effectiveness, and HC3-robust regression confirmed that differentiated learning significantly predicted both outcomes. The stronger predictive effect was observed for student engagement in terms of explained variance, whereas both models provided meaningful evidence supporting the proposed conceptual framework.

V. DISCUSSION

The present study examined the associations between differentiated learning techniques, student engagement, and perceived teacher effectiveness among secondary school students in Karnataka, India. Responding to the increasing diversity of contemporary classrooms and the policy emphasis on learner-centred education under the National Education Policy (NEP) 2020, the study investigated whether students' perceptions of differentiated instructional

practices were associated with two important educational outcomes. Overall, the findings supported the proposed conceptual framework. The measurement model demonstrated satisfactory psychometric quality, differentiated learning techniques were positively associated with both student engagement and perceived teacher effectiveness, and robust regression analyses indicated that differentiated learning significantly predicted both outcome variables.

The first notable finding concerns the reported level of differentiated learning. Students perceived that differentiated instructional practices were implemented at a moderate level and significantly above the neutral point of the response scale. This finding suggests that adaptive instructional approaches are present within participating secondary schools, although they have not yet become uniformly embedded across classroom practice. The result is consistent with the direction of educational reform in India, where NEP 2020 encourages learner-centred pedagogy, competency-based learning, formative assessment, and instructional flexibility. However, policy aspirations do not automatically translate into consistent classroom implementation. Teachers frequently operate within constraints such as large class sizes, examination-oriented curricula, limited preparation time, and varying access to professional development.

Consequently, differentiated learning appears to be emerging as an instructional practice rather than functioning as a universally established pedagogical norm.

The positive association between differentiated learning techniques and student engagement represents the second major finding. Students who perceived greater instructional adaptation also reported higher behavioural, emotional, and cognitive engagement. Although the observed relationship was moderate rather than exceptionally strong, it was statistically robust and educationally meaningful. This pattern suggests that adaptive instructional practices may create classroom conditions that encourage participation, sustain interest, and promote deeper cognitive involvement. Importantly, the relationship should not be interpreted as evidence that differentiation alone determines engagement. Student engagement is influenced by multiple factors, including classroom climate, teacher–student relationships, peer interaction, self-efficacy, family support, and school culture. Nevertheless, the findings indicate that differentiated instruction constitutes an important component of a broader learner-centred educational environment.

These findings are consistent with Self-Determination Theory, which proposes that educational environments supporting autonomy, competence, and relatedness foster higher-quality motivation and sustained engagement. Differentiated learning provides opportunities for meaningful choice, appropriately challenging tasks, scaffolded support, and responsive feedback, all of which may contribute to students' perceptions of competence and classroom participation. Similarly, the findings align with Social Constructivist perspectives, which emphasise learning through guided participation, interaction, and instructional scaffolding. Differentiated classrooms are more likely to encourage collaborative learning, active participation, and instructional responsiveness, thereby supporting the psychological and social conditions associated with engagement.

The study also demonstrated a significant positive relationship between differentiated learning techniques and perceived teacher effectiveness. Students who experienced greater instructional differentiation evaluated their teachers more favourably with respect to instructional clarity, responsiveness, fairness, classroom support, and overall effectiveness. This finding reinforces the view that teacher effectiveness is not evaluated solely through subject expertise or classroom discipline but also through teachers' ability to recognise learner diversity and respond appropriately to individual learning needs. Adaptive teaching therefore appears to function as a visible indicator of instructional quality from the learner's perspective.

Interestingly, differentiated learning explained a meaningful but not dominant proportion of the variance in perceived teacher effectiveness. This suggests that students' evaluations of teachers are influenced by differentiated instruction alongside many other instructional and interpersonal characteristics. Teachers who communicate clearly, establish positive classroom relationships, provide timely feedback, demonstrate subject expertise, and maintain supportive learning environments are also likely to be perceived as effective. Consequently, differentiated instruction should be viewed as one important dimension of effective teaching rather than its sole determinant.

The regression analyses provide additional insight by demonstrating that differentiated learning significantly predicted both student engagement and perceived teacher effectiveness. The explained variance was greater for student engagement than for perceived teacher effectiveness, indicating that instructional differentiation may have a stronger relationship with how students participate in learning than with how they evaluate overall teaching quality. This distinction is theoretically plausible. Student engagement represents an immediate classroom response that is likely to be influenced directly by instructional design, whereas perceptions of teacher effectiveness may reflect a broader

evaluation incorporating communication skills, classroom management, fairness, interpersonal relationships, assessment practices, and teacher credibility. Accordingly, differentiated instruction contributes meaningfully to both outcomes but operates within a wider educational context.

The findings also contribute to the emerging literature on differentiated instruction within non-Western educational settings. Much of the existing empirical evidence has been generated in Europe, North America, and Australia, where educational structures, teacher preparation, and classroom organisation differ from those in India. By examining students' experiences within Karnataka, the present study extends differentiated instruction research to a context characterised by multilingual classrooms, diverse school management systems, and considerable variation in educational resources. Although the findings should not be generalised beyond the study context without caution, they suggest that the educational value of learner-responsive instructional practices is not confined to Western schooling systems.

A further contribution of the study lies in its methodological approach. Many previous investigations have relied primarily on teacher self-reports to evaluate differentiated instruction. The present study instead focused on students' perceptions, recognising that learners are uniquely positioned to evaluate how instructional practices are experienced within everyday classroom interactions. Student reports cannot fully substitute for classroom observation or objective instructional assessment; however, they provide an important complementary perspective regarding the accessibility, responsiveness, and inclusiveness of classroom teaching. Incorporating students' perspectives therefore strengthens understanding of differentiated learning as an experienced educational process rather than solely a planned instructional strategy.

The study also contributes by integrating differentiated learning, student engagement, and perceived teacher effectiveness within a single

empirically validated framework. Previous research has often examined these constructs independently, limiting understanding of their interconnected nature. The present findings suggest that differentiated learning functions as an instructional approach associated simultaneously with greater learner engagement and more favourable evaluations of teaching quality. This integrated perspective provides a more comprehensive understanding of learner-centred pedagogy and offers a foundation for future investigations examining additional mediating or moderating mechanisms.

Despite these contributions, the findings should be interpreted within the study's methodological boundaries. The cross-sectional design prevents causal inference, and all variables were measured using student self-reports collected at a single point in time. Although the measurement model demonstrated satisfactory reliability and excellent overall fit, common-method variance and shared perceptual influences cannot be completely excluded. Furthermore, the observed relationships represent average patterns within the participating schools rather than deterministic effects applicable to every classroom or educational context. These considerations highlight the importance of interpreting the findings as evidence of meaningful associations rather than definitive causal relationships.

Taken together, the results indicate that differentiated learning techniques represent an important component of learner-centred secondary education. Students who perceive greater instructional responsiveness also report stronger engagement and more favourable perceptions of teacher effectiveness. While differentiated instruction is not the only factor shaping classroom experiences, the findings suggest that adaptive teaching contributes meaningfully to educational quality and supports current policy initiatives promoting inclusive, competency-based, and student-centred learning. Future research employing longitudinal, experimental, and mixed-methods designs will be valuable in clarifying the mechanisms through

which differentiated instruction influences educational outcomes and in identifying the contextual conditions under which its benefits are most effectively realised.

VI. THEORETICAL AND PRACTICAL IMPLICATIONS

The present study contributes to the growing body of educational psychology literature by providing empirical evidence regarding differentiated learning techniques within the context of Indian secondary education. Although differentiated instruction has been widely discussed conceptually, relatively few studies have simultaneously examined its associations with student engagement and perceived teacher effectiveness from the perspective of secondary school students in India. By integrating these constructs within a single empirically validated framework, the study extends current understanding of learner-centred pedagogy and demonstrates that differentiated learning is associated with multiple dimensions of classroom quality.

From a theoretical perspective, the findings reinforce Differentiated Instruction Theory by demonstrating that adaptive instructional practices remain educationally relevant in contemporary secondary classrooms characterised by increasing learner diversity. The results further support Self-Determination Theory, suggesting that instructional environments perceived as responsive to learner differences are associated with stronger student engagement. Likewise, the findings are consistent with Social Constructivism, which emphasises guided participation, collaborative learning, and instructional scaffolding as mechanisms supporting meaningful learning experiences. The study also aligns with the principles of Universal Design for Learning, highlighting the value of designing instruction that proactively accommodates learner variability rather than responding only after learning difficulties emerge. From a practical perspective, the findings have implications for teachers, school leaders, teacher educators, and policymakers. For classroom practitioners, the results suggest that

differentiated instruction should be viewed as a core pedagogical competency rather than an optional instructional strategy. Teachers may strengthen learner engagement by incorporating flexible grouping, scaffolded learning activities, differentiated formative assessment, and multiple opportunities for students to demonstrate understanding. Such practices can improve accessibility while maintaining consistent curricular expectations.

For school leaders, the findings highlight the importance of sustained professional development focusing on adaptive pedagogy, formative assessment, inclusive classroom management, and instructional coaching. Professional learning communities, collaborative lesson planning, peer observation, and mentoring may facilitate the translation of differentiated instruction from policy recommendations into routine classroom practice. Regular reflection on instructional responsiveness may also contribute to continuous improvement in teaching quality.

The findings additionally support the implementation priorities of India's National Education Policy 2020, which advocates learner-centred pedagogy, competency-based assessment, and inclusive education. Policymakers may therefore consider incorporating differentiated instructional competencies into pre-service teacher education, in-service professional development, and teacher appraisal frameworks. Such initiatives could strengthen teachers' capacity to respond effectively to learner diversity while supporting broader educational goals relating to equity, participation, and quality learning.

Overall, the study suggests that differentiated learning techniques represent a meaningful instructional approach capable of enhancing students' classroom experiences and supporting educational environments that are more inclusive, engaging, and responsive to learner diversity.

VII. LIMITATIONS AND FUTURE RESEARCH

Several limitations should be considered when interpreting the findings. First, the cross-sectional design does not permit causal inference; consequently, the observed relationships should be interpreted as statistically significant associations rather than evidence of causal effects. Longitudinal and intervention-based studies would provide stronger evidence regarding the direction and stability of these relationships over time.

Second, all variables were measured through student self-report questionnaires. Although students provide valuable insight into classroom experiences, future research would benefit from incorporating multiple sources of evidence, including classroom observations, teacher self-reports, administrator evaluations, and objective indicators of academic achievement.

Third, the study was conducted among secondary school students in Karnataka. While the sampling strategy enhanced representation within the selected context, future research should examine differentiated learning across different Indian states, educational boards, and cultural contexts to strengthen generalisability. Additional studies may also investigate potential mediating and moderating variables, including academic self-efficacy, classroom climate, digital learning readiness, teacher self-efficacy, school leadership, and parental involvement.

VIII. CONCLUSION

This study examined the relationships between differentiated learning techniques, student engagement, and perceived teacher effectiveness among 324 secondary school students in Karnataka, India. The findings demonstrated that differentiated learning was implemented at a moderate level and was positively associated with both student engagement and perceived teacher effectiveness. Robust regression analyses further indicated that differentiated learning significantly predicted both educational outcomes, supporting the proposed conceptual framework.

The study contributes context-specific empirical evidence to the literature on learner-centred pedagogy and highlights the educational value of adaptive instructional practices within Indian secondary education. While differentiated learning should not be viewed as a universal solution to all educational challenges, the findings suggest that it represents an important component of high-quality classroom practice that can support more inclusive, engaging, and responsive learning environments. Continued investment in teacher professional development, evidence-informed instructional design, and rigorous educational research will be essential for strengthening differentiated pedagogy and advancing equitable learning opportunities for diverse student populations.

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