

The Impact of Teaching Methods and Course Design on College Students' Self-Reported Learning Performance: An Empirical Study Based on SDG4

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ABSTRACT: Against the background of SDG4's emphasis on inclusiveness, equity and high-quality education, higher education teaching reform needs to pay attention to students' classroom participation, learning engagement and sustainable learning ability. Based on self-determination theory and student engagement theory, this study uses a questionnaire survey method to survey 310 Chinese college students, and uses descriptive statistics, reliability analysis and multiple linear regression analysis to This study explored the predictive role of teaching methods and course design in college students' comprehensive self-reported learning performance scores. The results show that the questionnaire has an acceptable internal consistency, and Cronbach's α is 0.732 and 0.760. Regression analysis shows that teaching methods and curriculum design variables can significantly predict the comprehensive score of students' self-reported learning performance, $F(5,304) = 149.27$, $p < 0.001$, $R^2 = 0.711$. Among them, teaching adaptability is the strongest predictor, $\beta = 0.311$, which shows that teachers choose teaching methods flexibly according to the teaching content and the actual situation of students, which is an important mechanism that affects students' overall classroom learning experience. Since the dependent variable is a self-reported comprehensive score, and some questions overlap with the independent variable, the results of this study should be understood as a predictive relatedness, not a direct proof of objective academic performance or causal relatedness. The study also found that there is still room for improvement in classroom equity participation and technology-assisted expression. This article provides practical inspiration for the improvement of college English classrooms, the innovation of higher education teaching and the sustainable development of SDG4-oriented education.

Keywords: Teaching adaptability, Teaching innovation, Course design, Self-reported learning performance, SDG4, Educational equity, Higher education reform.

1. INTRODUCTION

1.1. Research Background and Practical Significance of SDG4

The United Nations Sustainable Development Goal 4 (SDG4) emphasizes inclusive, equitable and quality education and advocates for lifelong learning opportunities for all. In the context of higher education, SDG4 not only requires colleges and universities to improve the quality of students' learning, but also requires the teaching process to pay more attention to

student differences, classroom fairness, learning engagement and sustainable learning ability. As an important course in general education in Chinese colleges and universities, there are obvious differences in students' English foundation, learning motivation and classroom participation. Therefore, teaching methods and

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curriculum design have an important impact on students' classroom learning experience. With the development of digital teaching and AI-assisted learning tools, teachers not only need to adjust teaching methods according to students' background and learning level, but also need to reasonably integrate digital tools and online platforms to support a fairer, interactive and sustainable learning environment (UNESCO, 2024; Leal Filho *et al.*, 2023; Miao & Holmes, 2023; Crompton & Burke, 2023; Rotar, 2025).

■ 1.2. Theoretical Framework and Literature Review

This research takes self-determination theory and student engagement theory as the main theoretical basis. Self-determination theory believes that students' learning motivation is affected by the three basic psychological needs of autonomy, competency and relatedness; when the classroom environment can support these psychological needs, students are more likely to form positive learning motivation and continue to participate (Ryan & Deci, 2024; Vansteenkiste *et al.*, 2020). Student engagement theory further points out that learning input includes multiple dimensions such as behavior, emotion, cognition and agentic engagement, and is closely related to students' learning results (Fredricks *et al.*, 2019; Reeve *et al.*, 2025; Wong *et al.*, 2024). Therefore, students' self-report learning performance is not only determined by personal ability, but also closely related to teaching methods, curriculum design, classroom atmosphere and teacher-student interaction.

Teaching adaptability is an important mechanism to connect teaching methods, curriculum design and students' learning performance. It not only refers to the use of diversified teaching methods by teachers, but also emphasizes that teachers can flexibly choose and adjust teaching strategies according to the course content, student foundation, learning feedback and classroom situations. Parsons *et al.* (2018) This teaching adjustment is understood as the process of teachers dynamically adjusting teaching practice according to students' social, language, cultural and learning needs. Relevant studies also show that the correlation between teaching content and students' background, classroom participation opportunities and student-centered teaching methods will affect students' English learning engagement and learning experience (Skarpaas, 2024; Yilmaz Bodur *et al.*, 2023; Hiver *et al.*, 2024; Jiang *et al.*, 2023; Umami *et al.*, 2024). Although this study takes college English classes as the research field, teaching adaptability is also applicable to other higher education courses such as science and engineering, business and social sciences.

Its essence is the professional judgment ability of teachers to dynamically adjust teaching strategies according to the subject content, student groups and classroom situations.

■ 1.3. Research Questions and Objectives

Based on the above research background and theoretical basis, this study takes Chinese college students as the survey object to explore the impact of teaching methods and curriculum design on the self-report learning performance of college students. Specifically, this study focuses on how factors such as diversified teaching methods, teaching adaptability, curriculum content expansion, student background considerations and teaching innovation affect students' learning performance. At the same time, it analyzes the possible shortcomings in classroom fair participation and technology-supported expression.

This study intends to answer the following three research questions:

RQ1: To what extent can teaching methods and curriculum design predict the self-reported learning performance of college students?

RQ2: In different teaching strategies, which factor is the strongest predictor of students' self-reported learning performance?

RQ3: From the perspective of SDG4 and sustainable education development, what room for improvement is there in college English classes in terms of fair participation and technology-assisted expression?

By answering the above questions, this study aims to provide an empirical basis for the improvement of college English classrooms, while extending the research findings to a broader context of higher education teaching innovation and reform, and providing practical inspiration for teachers' professional development, digital teaching reform and SDG4-oriented sustainable education development.

■ 2. RESEARCH METHODS

■ 2.1. Research Sample and Demographic Characteristics

This study adopts a quantitative questionnaire survey design, taking college students in China as the research object, and exploring the impact of teaching methods and curriculum design on students' self-reported learning performance. The study adopted a convenience sampling

method to distribute questionnaires to students of many colleges and universities in China through the online questionnaire platform, and finally kept 310 valid questionnaires. Due to the use of convenience sampling in this study, the research results are mainly used to explain the classroom learning experience of college students in the context of this study, and should not be directly promoted to all Chinese college students.

Sample demographic characteristics include gender, grade and self-assessment of English proficiency. In terms of gender, 174 women, accounting for 56.1%; 136 men, accounting for 43.9%. In terms of grades, there are 112 freshmen, accounting for 36.1%; 108 sophomores, accounting for 34.8%; and 90 juniors, accounting for 29.0%. In terms of self-assessment of English proficiency, 89 students think they are above average, accounting for 28.7%; 134 students rated themselves as average, accounting for 43.2%; 87 students are below average, accounting for 28.1%. Overall, the sample has a certain heterogeneity in terms of gender, grade and English level.

■ 2.2. Measurement Instrument and Questionnaire Structure

This study uses the self-compiled questionnaire "College English Classroom Learning Experience Survey" as a research tool. The questionnaire design mainly refers to the theory of self-determination and the theory of student input. Self-determination theory emphasizes that students' learning motivation is related to basic psychological needs such as autonomy, competence and relatedness (Ryan & Deci, 2024; Vansteenkiste *et al.*, 2020); student engagement theory emphasizes that learning input includes behavior, multiple dimensions such as emotion, cognition and behavioral (Fredricks *et al.*, 2019; Reeve *et al.*, 2025). Therefore, this study incorporates teaching methods, curriculum design, classroom equity, technology-supported expression, and students' learning behavior and motivation into the questionnaire structure.

The core questions Q1–Q18 of the questionnaire are measured by the five-point Likert scale. 1 means "very disagree" and 5 means "very agree". Among them, Q1–Q5 measures teaching methods and curriculum design, including teaching method diversity, teaching adaptability, content expansion, student background consideration and teaching innovation; Q6–Q9 measures classroom fairness and technology-supported expression; Q10–Q18 measures students' learning behavior and motivation. Q19–Q21 are demographic variables, including gender, grade and self-assessment of English level.

In terms of variable setting, this study takes Q1–Q5 as the main independent variable to represent teaching methods and curriculum design; takes the total score of Q1–Q18 as the comprehensive score of students' self-report learning performance, which is used to reflect students' overall classroom learning experience, teaching environment, learning behavior and learning motivation. Look at the evaluation. It should be noted that Q1–Q5 is also a part of the Q1–Q18 comprehensive score, so the subsequent regression results should be carefully understood as a predictive relatedness between the internal variables of the comprehensive learning experience, rather than a causal relatedness or a direct explanation of objective academic performance.

■ 2.3. Data Collection Procedure

The data of this study was collected from April to May 2025. The questionnaire is produced through the Wenjuanxing platform and distributed online through the college student group, course learning exchange group and academic exchange platform. Participants understand the purpose of the research before filling in the questionnaire and complete the questionnaire anonymously. The average filling time is about 2 to 3 minutes.

In order to ensure the quality of the data, the researchers check the completeness of the questionnaire after collecting the questionnaire, and exclude invalid or obviously abnormal answers. Due to the use of self-reporting data in this study, students' answers may be affected by social expectation bias, personal subjective perception and instant learning experience, which will be further discussed in the research limitations section. Finally, 310 valid questionnaires were kept for statistical analysis.

■ 2.4. Data Analysis Strategy

This study uses SPSS 26.0 to analyze the data. First, use descriptive statistics to present the mean, standard deviation and score range of the sample demographic characteristics and main variables; secondly, use Cronbach's α coefficient to test the internal consistency of the main dimensions of the questionnaire; finally, use the forced entry method to perform multiple linear regression analysis, with Q1–Q5 Teaching method and curriculum design variables are used as independent variables, and the Q1–Q18 self-reported comprehensive score of learning performance is used as the dependent variable to test the predictive effect of teaching methods and curriculum design on students' overall classroom learning

experience. All statistical tests take $p < 0.05$ as the criterion for judging the significance.

■ 3. RESULTS

■ 3.1. Descriptive Statistics of the Main Variable

This study first conducts a descriptive statistical analysis of the comprehensive score of students' self-reported learning performance. The results show that the average score of students' self-reported learning performance is 64.50, and the standard deviation is 11.84. The maximum possible score of the scale is 90 points, and the actual score range of the sample is 32 to 82 points. In general, students' self-reported learning performance is at the upper-middle level, indicating that most students have a positive evaluation of their college English classroom learning experience, learning behavior and learning motivation. At the same time, the large score range also shows that there are still certain differences between different students in terms of classroom participation, learning motivation and learning experience.

■ 3.2. Reliability Analysis of the Questionnaire

In order to test the internal consistency of the main dimensions of the questionnaire, this study uses Cronbach's α coefficient for reliability analysis. The results show that the teaching method and classroom atmosphere dimension, that is, Q1–Q9, there are a total of 9 questions, and Cronbach's α coefficient is 0.732; the learning behavior and motivation dimension, that is, Q10–Q18, there are a total of 9 questions, and Cronbach's α coefficient is 0.760. The Cronbach's α coefficient of both dimensions is higher than 0.70, indicating that the questionnaire has an acceptable internal consistency and can be used for subsequent statistical analysis.

■ 3.3. Regression Analysis of Learning Performance

In order to test the predictive effect of teaching methods and curriculum design on the comprehensive score of students' self-reported learning performance, this study takes Q1–Q5 as the independent variable, Q1–Q18 self-reported learning performance comprehensive score as the dependent variable, and uses the forced entry method for multiple linear regression analysis. The results show that the R value of the regression model is 0.843, the R^2 is 0.711, the adjusted R^2 is 0.706, and the standard estimated error is 6.425. This shows that under the current comprehensive score structure, the teaching methods and curriculum design variables represented by Q1–Q5 can significantly predict the comprehensive score of students' self-reported learning performance, and the model has strong statistical explanatory power.

It should be noted that the dependent variable of this study is the self-reported learning performance comprehensive score of Q1–Q18, and the independent variable Q1–Q5 is also part of the comprehensive score. Therefore, the explanatory power of the model may be affected by the comprehensive score structure, and R^2 should not be interpreted as the ratio of the interpretation of teaching methods to objective academic performance. This article understands the result as a predictive relatedness between teaching methods and curriculum design variables and students' overall classroom learning experience, rather than a direct proof of objective academic performance or causal relatedness.

Further analysis of variance shows that the overall regression model reaches a significant level, $F(5,304) = 149.27$, $p < 0.001$. This shows that the teaching methods and curriculum design variables represented by Q1–Q5 can significantly predict the comprehensive score of students' self-reported learning performance as a whole.

Table 1: Reliability Analysis of the Questionnaire

Dimension	Number of Items	Cronbach's α
Teaching Methods and Classroom Climate (Q1–Q9)	9	0.732
Learning Behaviors and Motivation (Q10–Q18)	9	0.760

Table 2: Regression Model Summary

R	R^2	Adjusted R^2	Standard Error of Estimate
0.843	0.711	0.706	6.425

Table 3: ANOVA Results

Model	Sum of Squares	df	Mean Square	F	p-value
Regression	30807.61	5	6161.52	149.27	< 0.001
Residual	12548.53	304	41.28		
Total	43356.14	309			

3.4. Analysis of Regression Coefficients

The regression coefficient results show that the five teaching methods and curriculum design variables have reached a significant level, $p < 0.001$. Among them, the standardized regression coefficient of Q2 "teachers can choose appropriate teaching methods according to the teaching content and the actual situation of students" is the highest, $\beta = 0.311$, indicating that in the current model, teaching adaptability is the strongest predictor of the comprehensive score of students' self-reported learning performance. Next is Q1 "Teachers use a variety of teaching methods", $\beta = 0.279$; Q5 "Teachers try new teaching methods", $\beta = 0.275$; Q4 "Curricula design takes into account students' background", $\beta = 0.245$; Q3 "Teaching content goes beyond textbooks", $\beta = 0.231$.

This result shows that although diversified teaching, teaching innovation, content expansion and student background consideration are all significantly related to the comprehensive score of students' self-report learning performance, the predictive role of teaching adaptability is the most prominent. In other words, compared with simply increasing the types of teaching methods or expanding the teaching content, students pay more attention to whether teachers can flexibly choose suitable teaching methods according to the teaching content, student foundation and classroom situation.

3.5. Summary of Results

In general, the results of this study show that under the current comprehensive score structure, teaching methods and curriculum design variables have a significant predictive effect on the comprehensive score of students' self-reported learning performance. Among them, teaching adaptability is the strongest predictor, indicating that teachers choose teaching methods flexibly according to the teaching content and the actual situation of students, which is an important factor affecting students' overall classroom learning experience, learning behavior and learning motivation. At the same time, diversified teaching, content expansion, student background consideration and teaching innovation also have significant predictive effects, indicating that students' self-report learning performance is jointly influenced by a variety of teaching factors.

In addition, the performance of questions related to classroom equity participation and technical-assisted expression is relatively weak, suggesting that there is still room for further improvement in college English classes in promoting students' equal participation and technical support expression. This finding is closely related to the goals of inclusive, fair and high-quality education emphasized by SDG4, and also provides an empirical basis for subsequent discussions on teaching innovation, classroom inclusiveness and digital teaching reform. It should be noted that the above results mainly reflect the

Table 4: Regression Coefficients

Independent Variable	Unstandardized B	SE	Standardized Beta	t	p-value
Constant	16.85	1.78	—	9.46	< 0.001
Q1: Use of various teaching methods	2.79	0.33	0.279	8.45	< 0.001
Q2: Selecting methods according to course content and student needs	3.11	0.33	0.311	9.34	< 0.001
Q3: Teaching content beyond the textbook	2.29	0.33	0.231	7.00	< 0.001
Q4: Course design considering student backgrounds	2.41	0.33	0.245	7.39	< 0.001
Q5: Teachers trying new teaching methods	2.55	0.32	0.275	8.00	< 0.001

overall classroom learning experience of students' subjective reports, and are not directly equivalent to objective academic performance.

■ 4. DISCUSSION

■ 4.1. Teaching Adaptability and Learning Performance

The most important finding of this study is that Q2 "Teachers can choose the appropriate teaching method according to the teaching content and the actual situation of students" has the strongest predictive effect among the five predictive variables, $\beta = 0.311$. This shows that in the comprehensive score of students' self-report learning performance, teaching adaptability has more predictive power than simply using multiple teaching methods, expanding teaching content or trying new methods. Students are not only concerned about whether teachers use "more" or "updated" teaching methods, but also pay more attention to whether teachers can choose the appropriate method according to the course content, student foundation and classroom situation.

This result can be explained by the theory of self-determination and the theory of student input. Self-determination theory believes that students' learning motivation is closely related to the three basic psychological needs of autonomy, competence and relatedness; when teachers can provide appropriate support according to students' actual level and learning needs, students are more likely to form positive learning motivation (Ryan & Deci, 2024; Vansteenkiste *et al.*, 2020). Student engagement theory also points out that students' behavioral input, emotional input, cognitive input and agentic engagement will be affected by the classroom environment and teaching method (Fredricks *et al.*, 2019; Reeve *et al.*, 2025). Therefore, the findings of this study show that teaching adaptability may be an important mechanism to connect teaching methods, curriculum design and students' learning input.

This finding is consistent with existing international studies. Martin *et al.* (The meta-analysis of 2024) shows that there is a close relatedness between student input and academic results; Hiver *et al.* (2024) Through a systematic review, it is pointed out that language learning input research has long focused on the relatedness between learner participation, classroom environment and learning process; Skarpaas (2024) also found that the correlation between teaching content and students' background is an important factor affecting English classroom input. This study further shows that in the

context of English classrooms in Chinese universities, teaching innovation should not only pursue the number of methods or technical forms, but should pay more attention to the adaptive teaching judgment of teachers.

■ 4.2. Cross-Disciplinary Value of Teaching Adaptability

Although this study takes college English classrooms as the research field, teaching adaptability is not limited to language education. Teaching adaptability is essentially a professional judgment ability of higher education teachers, that is, teachers can flexibly adjust teaching strategies according to student background, course objectives, subject content and classroom feedback. Parsons *et al.* (2018) also pointed out that the teaching adjustment of teachers is reflected in the continuous revision of teaching practice according to students' social, language, cultural and learning needs. Studies have further shown that flexible and student-centered teaching strategies help to enhance student participation (Umami *et al.*, 2024).

From the perspective of teaching innovation in higher education, teaching reform can not only be understood as the introduction of new teaching forms or technical tools. Truly effective teaching innovation should be reflected in the ability of teachers to judge "what method is suitable for which students, what content and what learning situation". Therefore, the findings of this study on teaching adaptability have interdisciplinary inspiration: in the science and engineering course, teachers can adjust experimental tasks and problem-solving steps according to the students' basis; in the business course, they can choose cases and simulated decision-making tasks according to students' experience; in the social science course, teachers can choose cases and simulate decision-making tasks according to students' experience; in the social science course, they can choose from multiple materials, discuss tasks and reflect on writing to promote students' participation.

Therefore, teaching innovation in higher education should not only emphasize "method diversification", but also "methodual suitability". In this study, although Q1 "using multiple teaching methods" and Q5 "trying new teaching methods" also have a significant predictive effect, their standardization coefficient is lower than that of Q2. This shows that new methods and diversified methods themselves are not enough to ensure a better learning experience. The key is whether teachers can make reasonable choices and adjustments according to the real needs of students.

■ 4.3. Classroom Inclusiveness and Educational Equity

This study found that the scores of questions related to fair participation in the classroom are relatively low, indicating that some students may still lack equal expression and full participation opportunities in college English classes. This finding is closely related to the goals of inclusiveness, equity and quality education emphasized by SDG4. SDG4 focuses not only on whether students can get educational opportunities, but also on whether students can get the opportunity to participate, express themselves and develop fairly in the learning process (UNESCO, 2024). Therefore, classroom fairness should not only be understood as all students accepting the same teaching arrangement, but should be understood as students of different levels, backgrounds and personality characteristics can get learning support that suits their own needs.

Studies have shown that cooperative learning, equal participation structure and inclusive classroom activities help enhance students' sense of belonging and classroom participation (Buchs *et al.*, 2023; Ooi & Cortina, 2023). Therefore, college English classes should further improve the distribution of opportunities to participate, especially to support students who have a weak English foundation, are introverted or worried about making mistakes. Teachers should not only pay attention to whether students complete learning tasks, but also whether different students have relatively fair opportunities to speak, interact and feedback, so as to implement the inclusive education advocated by SDG4 at the classroom level.

■ 4.4. Technology Support and Digital Teaching

The relatively low score of technical-assisted expression-related questions shows that the potential of digital tools in supporting students' expression, interaction and feedback has not been fully exploited. With the development of digital teaching and AI-assisted learning tools, technology has become an important part of higher education teaching reform. However, the results of this study do not show that technology itself will directly improve students' learning performance, but suggest that teachers need to pay more attention to the matching between technical tools and teaching goals, curriculum design and students' needs. Relevant studies also point out that the key to technology-enhanced learning is not the tool itself, but whether the technology is effectively

integrated into the teaching design (Bond *et al.*, 2020; Rotar, 2025).

From the perspective of students' input, digital tools can provide students with low-pressure and multi-form expression opportunities. For example, online voting, anonymous questions, collaborative documents, learning platform discussion areas and instant feedback tools can help students express their views and ask questions more safely. AI tools can also be used as language practice and feedback support, but their value needs to be realized through curriculum design, teacher judgment and learning support mechanisms, and cannot simply replace teachers (Miao & Holmes, 2023; Crompton & Burke, 2023). Therefore, digital teaching reform should be combined with teachers' adaptive teaching ability, instead of taking the use of technology as a formal requirement.

■ 4.5. Implications for Sustainable Educational Reform

Overall, this study shows that teaching adaptability, classroom inclusiveness and technology-assisted expression together constitute an important basis for teaching innovation in higher education. Teaching adaptability emphasizes that teachers can flexibly adjust teaching methods according to student differences and classroom situations; classroom inclusiveness emphasizes that different students should have fair participation and expression opportunities; technology-supported expression emphasizes that digital tools should serve student participation, feedback and learning support. Together, these three point to a more student-centered, fair and sustainable direction of classroom reform.

This discussion also responds to the requirements of interdisciplinary teaching reform. Educational psychology helps to explain students' motivation and learning input. Curriculum design focuses on the matching between teaching goals, activities and evaluation. Educational technology focuses on how digital tools support expression and feedback, and SDG4 provides a value framework for fairness, inclusiveness and lifelong learning (UNESCO, 2024; Leal Filho *et al.*, 2023). Therefore, the significance of this study is not limited to university English teaching, but also provides a reference for higher education to promote teaching innovation and sustainable development through adaptive teaching, inclusive classroom and digital support.

■ 5. PRACTICAL IMPLICATIONS AND POLICY RECOMMENDATIONS

■ 5.1. Teacher Development Centered on Teaching Adaptability

The results of this study show that teaching adaptability is the strongest predictor of the comprehensive score of students' self-reported learning performance. Therefore, teachers' professional development should not only focus on "increasing teaching methods" or "using new technologies", but should pay more attention to teachers' adaptive teaching decision-making ability. The so-called adaptive teaching decision-making means that teachers can flexibly choose and adjust teaching methods according to the course content, student foundation, learning feedback and classroom situation. This is closely related to the support of autonomy, competence and relatedness emphasized by self-determination theory (Ryan & Deci, 2024; Vansteenkiste *et al.*, 2020).

In actual teacher training, colleges and universities can design professional development activities around the three links of "pre-class diagnosis - classroom adjustment - after-class reflection". Teachers can understand the basics of students through short questionnaires, preview tasks or learning platform data before class; adjust the explanation, discussion, practice and feedback methods according to students' reactions in the classroom; and further optimize the teaching design through teaching reflection logs, student feedback or peer viewing after class. Colleges and universities can also help teachers continue to improve their adaptive teaching ability through teaching communities, peer watching classes, classroom action research and special workshops.

■ 5.2. Promoting Equitable Classroom Participation

This study found that the performance of questions related to fair participation in the classroom is relatively weak, indicating that some students may still lack full expression and participation opportunities in college English classes. Therefore, classroom reform needs to pay more attention to the fairness of the process, not just whether the teaching content is completed. Classroom fairness does not mean that all students receive exactly the same teaching arrangements, but that students of different levels, personalities and learning backgrounds can get opportunities to participate according to their needs.

In classroom practice, teachers can adopt a more structured participation strategy. For example, "Think-Pair-Share" allows students to think independently first,

then communicate with peers, and finally share with the whole class, thus reducing the anxiety caused by direct speech. Puzzle-like cooperative learning, group role division, rotating speech, anonymous questions and layered tasks can also help students with weak English foundation or lack of confidence to get safer opportunities to participate. Through more equitable participatory design, college English classes can better respond to the goals of inclusive, fair and high-quality education emphasized by SDG4 (UNESCO, 2024).

■ 5.3. Strengthening Technology-Supported Expression

This study also found that the performance of technically assisted expression-related questions is relatively weak, indicating that digital tools still have room for further development in supporting students' expression, interaction and feedback. Under the background of the continuous development of digital teaching and AI-assisted learning tools, colleges and universities should not only focus on the construction of platforms and equipment, but also pay attention to how technology truly serves students' learning and classroom participation. Educational technology research shows that digital tools should be understood in combination with student input, classroom interaction and teaching design, rather than used as independent tools (Bond *et al.*, 2020; Rotar, 2025).

In college English classes, teachers can use online voting, anonymous questions, collaborative documents, learning platform discussion areas and instant feedback tools to provide students with low-pressure and multi-form expression opportunities. AI dialogue assistant can also be used as a potential language practice and feedback support tool, but its effect still needs to be further studied. It should be noted that AI and digital tools can only be used as teaching support means and cannot replace teachers' teaching judgment; their application should be people-oriented and educational goal-oriented (Miao & Holmes, 2023; Crompton & Burke, 2023).

■ 5.4. Adaptive-Inclusive-Sustainable Teaching Model

Based on the two main findings in this study that "teaching adaptability has the strongest predictive effect" and "classroom fair participation and technical-assisted expression still has room for improvement", this paper proposes the "Adaptive-Inclusive-Sustainable Teaching Model" (Adaptive-Inclusive-Sustainable Teaching Model, AIS Model), as a practical framework for college teachers

to improve classroom teaching. The model emphasizes three levels of coordination: at the micro level, it focuses on the adaptive teaching decision-making ability of teachers; at the middle level, it focuses on the fairness and inclusive learning environment of the classroom process; at the macro level, it focuses on the institutional support of colleges and universities, the professional development of teachers and the guarantee of digital teaching.

Specifically, at the micro level, teachers need to identify students' needs and optimize teaching strategies through pre-class diagnosis, classroom adjustment and after-class reflection; at the middle level, teachers should promote fair participation through cooperative learning, structured speech, anonymous expression and hierarchical tasks; at the macro level, colleges and universities should through the teaching community, Digital teaching training, classroom action research and teaching evaluation reform support teachers' continuous improvement. The purpose of this model is not to increase the additional teaching burden, but to help teachers integrate teaching adaptability, classroom inclusiveness and digital support into a continuously improved teaching cycle, so as to better implement the inclusive, fair and sustainable educational goals emphasized by SDG4.

■ 6. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

■ 6.1. Main Conclusions and Theoretical Contributions

Based on the inclusive, fair and high-quality education advocated by SDG4, this study explores the predictive role of teaching methods and curriculum design on the comprehensive score of college students' self-reported learning performance based on self-determination theory and student engagement theory. The research results show that the teaching methods and curriculum design variables represented by Q1–Q5 can significantly predict the comprehensive score of students' self-reported learning performance, indicating that students' overall classroom learning experience, learning behavior and learning motivation are closely related to teachers' teaching methods and curriculum design. This result responds to the view of self-determination theory on the influence of the learning motivation of classroom support environment, and is also consistent with the view of the student engagement theory that the teaching environment affects student participation (Ryan & Deci, 2024; Fredricks *et al.*, 2019; Reeve *et al.*, 2025).

The most prominent finding of this study is that teaching adaptability is the strongest predictor among the five teaching variables, which shows that students pay more attention to whether teachers can flexibly choose suitable teaching methods according to the teaching content, student foundation and classroom situation. It should be noted that the results of this study reflect the predictive relatedness between variables, not the direct causal impact of teaching methods on objective academic performance. In addition, the study found that there is still room for improvement in classroom equity participation and technology-assisted expression. Based on this, this article proposes the "Adaptive-Inclusive-Sustainable Teaching Model" (AIS Model), which provides a preliminary reference for the improvement of college English classrooms and the innovation of higher education teaching.

■ 6.2. Limitations and Future Research Directions

There are still certain limitations in this study. First of all, the research adopts a convenience sampling method. Although the sample size reaches 310 people, the sample source and representativeness are limited, so the research results should not be directly promoted to all universities, regions or disciplinary groups. Secondly, this study uses students' self-reporting data to measure the comprehensive score of learning performance. The results may be affected by social expectation bias, subjective perception and instant learning experience. Therefore, the regression results of this article should be understood as a predictive relatedness between teaching methods and the overall classroom learning experience, not a causal relatedness or a direct proof of objective academic performance.

In addition, since the comprehensive score of the dependent variable is Q1–Q18, and the independent variable Q1–Q5 is also part of the comprehensive score, the explanatory power of the regression model may be overestimated to a certain extent. Future research can take the Q10–Q18 learning behavior and motivation dimensions as dependent variables alone, or add multi-source data such as objective performance, classroom observation, learning platform behavior data and student interviews to establish a clearer prediction model. Subsequent research can also use longitudinal tracking or quasi-experimental design to further test the applicability of adaptive teaching strategies and AIS models in different disciplines and college situations.

■ AUTHOR CONTRIBUTION STATEMENT

Peng Jiaxin was responsible for the research topic development, study design, questionnaire organization,

data analysis, and initial manuscript drafting. Yang Yifan and Zeng Ziyi contributed to questionnaire distribution, data organization, literature collection, and manuscript formatting. All authors have read and approved the final manuscript and agreed to its submission for publication.

■ CONFLICT OF INTEREST STATEMENT

The authors declare that there are no known financial or non-financial conflicts of interest that could have influenced the research design, data analysis, manuscript writing, or publication process of this study.

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