

Technology-driven Instructional Design: A Study with The SAMR Design Model

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Abstract: With the advancement of Education Informatization 2.0 Action Plan, the deep integration of information technology and education and teaching has become an important trend in the field of education. Mobile technology, as a key driving force, is reshaping the education ecology and improving the quality of teaching. The current technology application mostly stays at a shallow level and the potential is not fully utilized. Based on the SAMR design model, this study aims to construct a new model of mobile technology-assisted teaching and empirically analyze its effectiveness and challenges in college English teaching. Through in-depth analysis of the four levels of the SAMR model, namely, substitution, enhancement, modification, and redefinition, the framework of the mobile-assisted teaching model is constructed by clarifying the mobile technology application scenarios and strategies in conjunction with the needs of university English teaching. The empirical study shows that the model significantly improves students' learning participation, independent learning ability and comprehensive quality, and at the same time enhances the fun and interactivity of teaching. However, the use of mobile devices for teaching and learning activities also brought about the problem of student distraction. This study proposes that the teaching model should be further optimized in the future to give full play to its advantages and avoid potential shortcomings, so that the technology can better serve college English teaching and learning, enhance teaching effectiveness and promote effective learning.

Keywords: AMR model, mobile technology, college English teaching, instructional design, education informatization.

1. Introduction

Education informatization 2.0 action plan is leading a profound change in global education, focusing on the deep integration of information technology and education teaching, aiming at optimizing resource allocation and enhancing utilization efficiency. Mobile technology, as a key driving force, not only promotes the digitization of education content and modernization of teaching methods, but also reshapes the education ecosystem, makes personalized learning possible, and enhances distance learning and real-time interaction to improve the quality of teaching. However, the current application of technology mostly stays at a shallow level and its potential is not fully realized. Therefore, it is especially critical to explore innovative paths for deep integration of technology into teaching and learning. The SAMR model serves as a theoretical framework that provides guidelines for the role of technology in teaching and learning and promotes innovation in teaching and learning activities through the four levels of Substitution, Enhancement, Modification, and Redefinition (see Fig. 1). Based on the SAMR model, this study aims to construct a new model of mobile technology-assisted teaching and empirically analyze its effectiveness and challenges in university English teaching. Through in-depth analysis of the various levels of the SAMR model, combined with the needs of university English teaching, we clarify the application scenarios and strategies of mobile technology, construct the framework of mobile-assisted teaching model, empirically verify its effectiveness, and explore the challenges and solutions in practical application, such as using mobile learning applications to strengthen the understanding of knowledge, designing project-based learning tasks to innovate the teaching method, and using virtual reality and augmented reality to redefine the English learning experience. The challenges and solutions in practical

applications are discussed, such as utilizing mobile learning applications to enhance knowledge comprehension, designing project-based learning tasks to revolutionize teaching methods, and using virtual reality and augmented reality to redefine the English learning experience.

2. Theoretical Cornerstones

2.1. A comparative review of the SAMR model and the technology integration model

SAMR model, proposed by Dr. Ruben Puentedura, an expert in educational technology, profoundly reveals the depth of the application of technology in teaching and its driving effect on teaching change through four progressive levels: substitution, enhancement, modification, and redefinition [1]. From simply replacing traditional teaching tools to enhancing the learning experience, changing the design of learning tasks, and even creating a whole new way of learning, the SAMR model demonstrates its great potential for transforming the learning experience and outcomes by taking the example of university English teaching. Compared with other technology integration models such as the TPACK framework and the TIM model, the SAMR model focuses more on assessing the level and transformative impact of technology application directly from the task itself, and although it shares the core concept with TPACK, it emphasizes more on the transformative power of technology (see Table 1). In educational practice, the SAMR model provides teachers with a clear framework that guides the direction of technology application, encourages innovative pedagogical approaches, and reshapes learning tasks and processes to enhance the student learning experience. However, the model also has limitations such as over-reliance on technology, subjectivity in assessment, and the effectiveness of application in complex scenarios to be

verified. Therefore, teachers should flexibly use the SAMR model and other integration models in combination with specific teaching scenarios and students' characteristics to

explore the deep integration of technology and teaching, and promote the quality development of education.

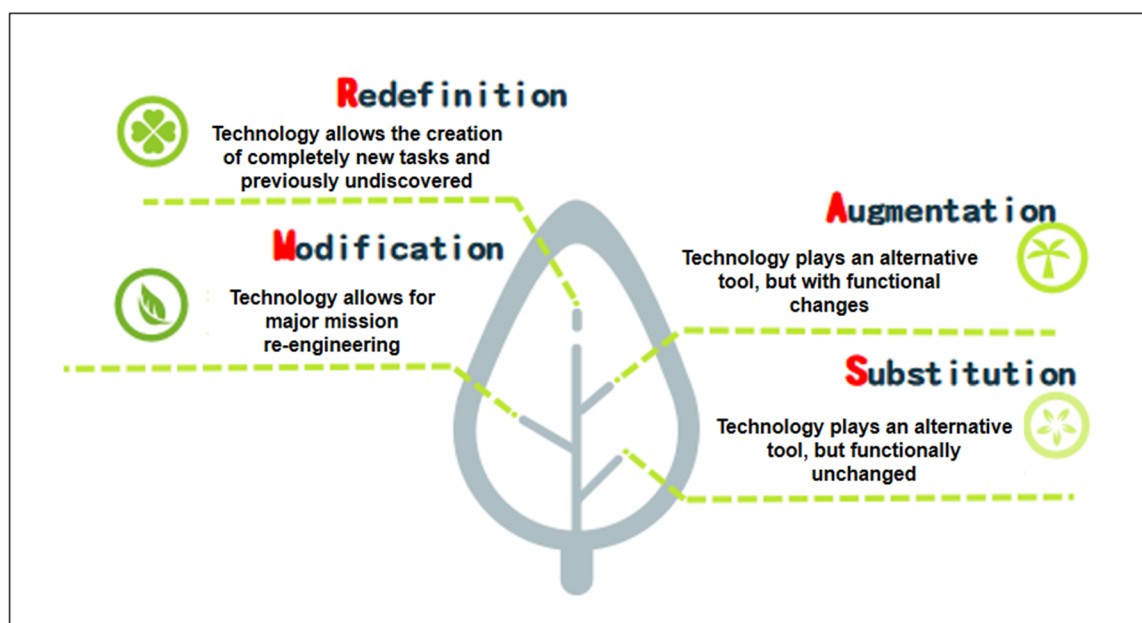


Figure 1. SAMR model

Table 1. Comparison of technology integration models

Technology integration model	Angle	Assessment dimensions	Application advantages	Potential limitations
SAMR model	Mandate change	Hierarchical structure	Clear frameworks to facilitate technology integration and encourage innovation	Possible over-reliance on technology and subjectivity of assessments
TPACK framework	Teacher knowledge	Integrationist relationship	Improving the knowledge structure of teachers	Less focus on mandate change
TIM model	Implementation steps	Process properties	Provide specific integration steps	Focus on process description, with insufficient transformative emphasis

2.2. Frontier explorations of mobile technology-enabled language learning

Mobile learning, relying on the popularity of mobile devices such as smartphones and tablets, has become an emerging learning paradigm, and its core qualities - portability, immediacy and personalization - have significantly broadened the boundaries of language teaching [2]. Learners can study efficiently in fragmented time such as commuting and resting, instantly access resources such as vocabulary and grammar to solve learning problems, and at the same time enjoy the customized content provided by the mobile learning platform to promote the learning effect. This model breaks through the time and space constraints of traditional teaching and makes language learning closely related to the reality of life, and enhances the practicality and attractiveness of learning. In practice, Duolingo has created a fun learning experience through gamification design and mobile device interaction, attracting hundreds of millions of users worldwide, and using big data analysis technology to achieve personalized learning path recommendations and enhance learning efficiency. Babbel, on the other hand, helps

learners improve their language ability systematically by virtue of its scientific and rigorous curriculum and high-quality content, and its mobile device positioning function provides real-time translation and pronunciation guidance, which promotes the deep integration of learners in the language environment [3]. Thus, mobile technology not only provides a convenient tool for language learning, but also stimulates learners' interest and motivation with innovative teaching modes and personalized experiences, bringing far-reaching changes to language teaching and broad prospects for future application.

3. Construction and Implementation of Teaching Mode Based on SAMR Model

3.1. Analysis of teaching objects and learning conditions

This study was carried out on 100 first-year students of non-English majors who were taught in this semester, including 48 students in class 24B15 majoring in economic

statistics and 52 students in class 24B25 majoring in software engineering. The students' English scores in the college entrance examination showed significant differences, with a mean score of 100.5 and a standard deviation of 14.6, indicating that traditional teaching methods are difficult to meet their individual needs. 24B15 class has a high proportion of female students, with a dull atmosphere but good concentration, and their English listening, reading and writing skills are stronger than their speaking skills. 24B25 class has a high proportion of male students, with an active classroom atmosphere, but some of them are easy to be distracted, and their reading and writing skills are better than their listening and speaking skills. The students in both classes have the external learning motivation of passing the University English IV examination. It is worth noting that all students

hold smartphones and 80% are unwilling to store their cell phones in class, which provides an opportunity for the study. Based on the SAMR model, the teaching goal is clearly defined as the use of mobile devices such as smartphones to personalize the push of learning resources, focusing on strengthening and modifying the teaching level, and gradually upgrading to the redefinition level. For class 24B15, an online speaking practice platform and virtual reality technology will be used to enhance speaking skills; for class 24B25, mobile collaboration tools will be utilized to promote cooperative group learning and comprehensively enhance reading, writing and listening skills. The aim is to promote innovation in teaching methods through technology integration, realize the deep integration of technology and teaching, and enhance students' learning experience and outcomes.

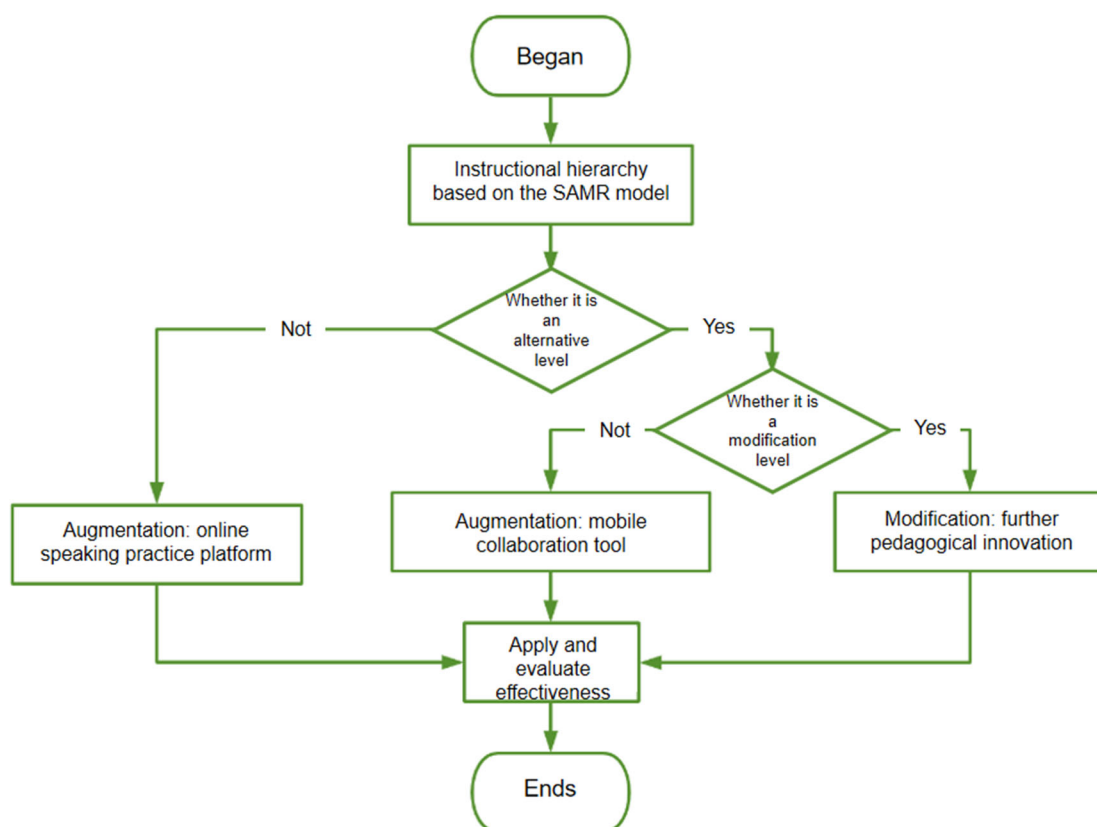


Figure 2. Instructional model construction of the SAMR model

3.2. Innovative design and implementation strategies for teaching models

In the construction of the new teaching ecology of “online-offline integration”, relying on the SAMR model, college English teaching realizes the organic combination of offline classroom knowledge transfer and online platform independent learning (see Table 2). Students use smartphones and other mobile devices to enhance their participation in the classroom through code-sweeping and online question-answering, and carry out personalized learning with the help of language learning APPs after class to promote the in-depth internalization of knowledge. The learning path design of “in-class and out-of-class linkage” forms a complete learning loop through the release of pre-study materials before class, group discussion in class, and the provision of handouts and online tests after class, which enhances the systematic nature

of learning and cultivates independent learning ability. The interactive teaching mode of “teacher-student collaboration” utilizes mobile technology to realize instant interaction and in-depth communication between teachers and students, which improves teaching efficiency and promotes cooperative learning. In terms of implementation strategy, the deep integration of teaching activities and technical tools becomes the key. Teachers need to carefully select and integrate technical tools, such as online questionnaires and big data analysis, in order to realize accurate teaching. The selection and optimal allocation of teaching resources are also crucial. Teachers should screen out high-quality resources and integrate and share them through the mobile platform, and encourage students to participate in resource construction. Dynamic management of the teaching process and effectiveness evaluation mechanism is an important guarantee of teaching quality. Teachers should monitor the

students' learning progress in real time, use a combination of process and summative evaluation to comprehensively evaluate students' performance, and conduct regular

reflection and summary of the teaching process in order to optimize the teaching mode and implementation strategies and improve the quality and effectiveness of teaching.

Table 2. Examples of teaching activities based on the SAMR model

SARM model hierarchy (bottom-up)	Examples of teaching activities	
	Classrooms	Extracurricular
Redefinition	1. Carrying out the flipped classroom, the teacher will record the knowledge point explanation into a video students watch outside the classroom, and the classroom teacher will test. 2. Students write in groups through tencent documents.	1. Students work in groups to make a video showing a certain social phenomenon and their attitudes. 2. Students edit the movie video and dub it.
Modification	1. Conduct an online discussion and broadcast the results on screen.	1. Teachers personalize the push of extracurricular supplementary materials according to the different levels of students.
Augmentation	1. Have students use an electronic dictionary to access key vocabulary instead of being directly informed of word meanings. 2. Students send pop-up comments to interact in class. 3. Use videos and pictures for multimodal teaching.	1. Students complete exercises and tests on the textbook learning platform. 2. Teachers provide students with feedback on their writing through the revision mode. 3. Teachers provide students with feedback on their speaking assignments through voice.
Substitution	1. Mobile phone check-in. 2. Random roll call.	1. Teacher provides students with electronic materials. 2. Students memorize the words using the APP.

4. Practice Findings and Discussion

4.1. Research design and practice feedback

This study integrates questionnaire surveys and in-depth group interviews to explore in depth the effectiveness of the implementation of the mobile technology-assisted college English teaching model based on the SAMR model. The questionnaire survey was conducted at the end of each semester, covering 100 students to ensure that the data were comprehensive and representative, and centered on the four dimensions of enjoyment, self-discipline, satisfaction, and perceived learning performance, using a 5-level Likert scale

supplemented with open-ended questions. Group interviews were conducted with a selection of 19 study group representatives, divided into 5 groups for in-depth communication, and the interviews were fully audio-recorded and transcribed for analysis. The results of the study showed that students had an overall positive attitude towards the teaching mode, with high mean scores for enjoyment, satisfaction and perceived learning performance, but a slight lack of self-discipline, especially the lowest self-discipline scores when using cell phones to study in English classes, which was consistent with the results of the open questions of the questionnaire and word cloud analysis, revealing the dual effect of mobile devices (see Table 3).

Table 3. Student feedback on mobile technology-assisted college english teaching model based on the SAMR model

Dimension	Mean value (M)	Standard deviation (SD)
Degree of enjoyment	3 . 91	0. 79
Self-discipline	3 . 71	0. 81
Satisfaction	3 . 78	0. 78
Perceived learning performance	3 . 80	0. 78

Group interviews further validated the questionnaire results and explored in detail the multidimensional impact of the teaching model, with students generally agreeing that mobile devices enhance teaching convenience and interactivity, but that students with poor self-discipline are susceptible to interruptions. In terms of instructional activity design, each level of the SAMR model was practiced to varying degrees, with activities at the substitution and enhancement levels being popular, and activities at the

modification and reinvention levels being challenging but critical to improving students' overall quality [4]. The interviews also revealed the effectiveness and challenges of the cultivation of mobile learning awareness and independent learning ability, and put forward specific suggestions for the cultivation of students' self-discipline, such as the use of cell phone application locks, clear classroom instructions, etc., which provide useful references for the subsequent teaching practice, suggesting that the promotion of this teaching model

needs to take into account the differences in students' self-discipline, and to optimize the effectiveness of the teaching by taking targeted measures.

4.2. In-depth discussion and reflection

The mobile technology-assisted college English teaching model based on the SAMR model has become an important trend in education reform with its significant advantages, realizing a comprehensive innovation in teaching activities and a seamless connection between classroom and extracurricular. The multifunctionality of mobile devices also brings the challenges of students' self-discipline development and distraction problems. Teachers need to adopt comprehensive strategies, including setting clear learning objectives and tasks, utilizing technology to limit the use of non-learning applications, and enhancing students' self-management skills through classroom discussions and case studies. Based on practical feedback, the optimization of the teaching mode is crucial. Teachers should carefully design teaching activities according to the learning situation, ensure that the difficulty matches the level of the students, gradually introduce challenging tasks, and clarify the purpose of the activities, so that students can perceive the value of learning through participation. Teachers also need to pay attention to the effects of mobile technology application and flexibly adjust their teaching strategies to ensure that the teaching mode continues to effectively serve students' learning and development, give full play to its advantages, and provide solid support for students' learning and growth.

5. Conclusions and Recommendations

The SAMR model, as a theoretical framework guiding the deep integration of technology and education, emphasizes the importance of choosing appropriate technological tools in the teaching and learning process. Using this model as a reference, this study designed a mobile technology-assisted college

English teaching model, aiming to empower college English teaching practice through information technology. This model not only brings significant convenience to the teaching and learning of college English, such as enhancing the fun of learning through rich and diverse classroom activities to stimulate students' motivation, but also makes it possible to tailor the teaching to the needs of the students, and effectively improves the students' information literacy and comprehensive quality. However, along with these advantages, the use of mobile devices to carry out teaching activities also brings the disadvantage that students may be distracted. Nonetheless, this teaching mode has been widely accepted and recognized by students due to its many advantages, and is in line with the development needs of education informatization 2.0. Looking ahead, in order to further enhance teaching effectiveness and promote effective learning, it is necessary to continuously optimize this teaching mode, fully develop its advantages, while avoiding potential shortcomings, so that the technology can more accurately and efficiently serve the teaching and learning of college English.

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