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Enhancing Space English Teaching: Application of the BOPPPS Model in Space English Classrooms

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Abstract: This paper explores the application of the BOPPPS teaching model in Space English education to address the limitations of traditional methods. Incorporating the six steps of the BOPPPS model—Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary—into Space English classrooms can enhance student engagement, improve cross-cultural communication, and combine space knowledge and language proficiency, ultimately improving the effectiveness of Space English teaching and better preparing students for global space collaboration.

Keywords: Space English; BOPPPS; Teaching model

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1. Introduction

With the rapid advancement of global space exploration, international cooperation in space-related activities has become increasingly important [1]. As the universal language of the space sector, English plays a critical role in ensuring effective collaboration among space personnel worldwide [2]. Mastery of Space English has thus become an essential skill for participating in global space initiatives [3]. To enhance students' ability to use English in their professional studies and future careers, several Chinese universities have introduced Space English courses for undergraduate students majoring in space engineering or have integrated Space English content into their regular English curriculum. However, most programs still rely on the traditional teaching model of reading, translation, and writing, which strengthens students' reading and writing abilities but falls short in developing cross-cultural communication skills and practical language application [4]. Moreover, these courses focus primarily on the professional content in the reading materials, leading to a significant gap in integrating English with space-related knowledge. Therefore, this study aims to explore how the BOPPPS teaching model can be applied to reform and enhance the Space English classroom, improving the overall

effectiveness of Space English education.

2. Framework of the BOPPPS model

The BOPPPS teaching model originated in the 1970s within the community education system in British Columbia, Canada. It is a goal-oriented instructional framework that prioritizes teacher-student interaction. Initially developed for use in Canadian Instructional Skills Workshops (ISW), the BOPPPS model has gained global popularity due to its practicality and effectiveness, becoming a standard tool in teacher training [5]. The model consists of six steps: Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary [6]. By clearly defining learning objectives and fostering greater classroom interaction and feedback, the BOPPPS model enhances student engagement and improves overall classroom effectiveness, enabling students to better absorb knowledge and apply it in real-world contexts [7].

2.1. Application of the BOPPPS model in Space English classroom teaching

The structured approach of the BOPPPS model effectively enhances classroom interaction and student participation, enabling students to master the terminology and professional knowledge of Space English more effectively [8]. As a result, implementing the BOPPPS model in Space English instruction is crucial for improving learning outcomes.

2.1.1. Bridge-in

The Bridge-in step establishes a context that connects new knowledge to students' prior understanding, capturing their attention and sparking interest in the subject [9]. In Space English instruction, this step can be implemented in various ways. For instance, when teaching the topic of "Space Environment", the teacher can show a real video of the Tiangong Space Station or a documentary featuring Chinese astronauts conducting spacewalks, immersing students in authentic space mission scenarios. The video can introduce key space terminology, such as "microgravity", "vacuum", and "radiation", helping students seamlessly integrate English language learning with space concepts through both visual and auditory stimuli.

2.1.2. Learning outcomes

Setting clear learning outcomes ensures that educational goals are precisely defined [10]. In the 1950s, American educational psychologist Benjamin Bloom introduced Bloom's Taxonomy of Cognitive Domains, which categorizes cognitive abilities into six levels, from basic to advanced: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation [11]. Bloom's theory highlights the hierarchical and systematic nature of learning objectives, enabling teachers to design course content that aligns with students' cognitive development and facilitates progressive learning.

In teaching Space English, teachers can utilize Bloom's taxonomy to establish learning goals that progress from basic to advanced levels, guiding students from mastering foundational knowledge to developing higher-order thinking, thereby fostering cognitive growth. For example, when teaching "Satellite Navigation", the learning objectives for beginner, intermediate, and advanced levels might include: accurately expressing basic satellite navigation terminology and concepts in English and explaining how the system operates; describing the application of satellite navigation technology in space missions and analyzing its strengths and limitations in various environments; and evaluating the effectiveness of different satellite navigation systems and suggesting

potential improvements. By setting progressively higher goals, this approach not only enhances students' language proficiency but also promotes the integration of space knowledge, critical thinking, and problem-solving skills.

2.1.3. Pre-assessment

Using students' prior knowledge encourages student involvement in the learning process [12]. The pre-assessment step enables teachers to gauge students' prior knowledge, skill levels, and learning needs. By carefully designing pre-assessment activities, Space English teachers can tailor classroom content and teaching methods to better address students' needs. For instance, when teaching the topic "Launch and Recovery", the pre-assessment can include a brief questionnaire or a small quiz to evaluate students' understanding and their ability to use specialized vocabulary such as "launch vehicle", "recovery operation", and "trajectory." Additionally, oral questioning or group discussions can prompt students to share their perspectives on launch and recovery, stimulating their critical thinking and preparing them for the lessons ahead.

2.1.4. Participation

Participation-based learning emphasizes active student engagement in the classroom [13]. It goes beyond mere knowledge delivery by fostering interaction and application, enabling students to learn through practice. In Space English classrooms, teachers can encourage students to apply what they have learned in real or simulated contexts through discussion, collaboration, and hands-on activities. For example, when teaching "Space Launch Sites", the teacher can divide students into groups, with each group responsible for presenting in English the functions, structural features, and roles of various components of the launch site (such as the assembly plant, launch tower, fueling system, and control center). By researching, organizing materials, and delivering oral presentations in English, students not only deepen their understanding of key launch site components but also significantly enhance their English communication skills, fostering a dual improvement in both language proficiency and professional competence.

2.1.5. Post-assessment

After the teaching activity, the teacher can employ various forms of assessment, such as quizzes, task presentations, or oral reports, to evaluate whether students have met the learning objectives. The post-assessment not only wraps up the learning process but also reinforces knowledge, enhances skills, and provides valuable feedback for teaching [14]. For instance, when covering the topic of "Space Environment", the post-assessment can involve students working in groups to deliver an oral report on the characteristics of the space environment (such as microgravity, radiation, and vacuum) and their effects on spacecraft design and astronaut health. Students should consult English-language sources, correctly use space-related terminology, and present their findings in English. This post-assessment strengthens students' understanding and communication of professional knowledge while also improving their ability to synthesize information, structure language, and engage in cross-cultural communication, leading to a deeper integration of language proficiency and domain-specific expertise.

2.2. Summary

Before the end of the class, teachers guide students in reviewing the material covered, organizing their

knowledge structures, and reflecting on the learning process. This not only helps students reinforce their understanding and solidify key concepts but also prepares them for future learning [15]. In the Space English classroom, when teaching "Satellite Communication", the teacher can prompt students to review core concepts and terms discussed in the lesson, such as "geostationary orbit" and "uplink/downlink", and briefly explain their functions and applications in English. Through this summary step, students not only consolidate the knowledge they have acquired but also improve their ability to articulate concepts and organize ideas logically in English, thereby laying a strong foundation for further study.

3. Conclusion

In conclusion, incorporating the BOPPPS teaching model into Space English classrooms enhances both the structure and interaction of the teaching process, significantly improving students' ability to use English in professional contexts. By integrating the six steps—Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary—teachers can effectively assess students' learning progress, design targeted teaching activities, and support their holistic development in knowledge acquisition, language expression, critical thinking, and cross-cultural communication. Particularly in mastering space terminology, applying English in real-world contexts, and simulating space missions, students achieve a deep integration of language skills and professional expertise. Looking ahead, the BOPPPS model holds substantial potential for furthering Space English teaching reforms, contributing to the cultivation of high-quality talent with both global perspectives and professional competence, and fostering the international growth of China's space industry.

Disclosure statement

The author declares no conflict of interest.

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