Writing Course Reform for Emerging Engineering Education: The Integration Path of Project-Based Learning (PBL) and Genre-Based Approach (GBA)

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Abstract: The development of Emerging Engineering Education requires engineering talents to possess not only solid professional capabilities but also core writing literacy such as written communication, professional text creation, and cross-domain writing expression. Project-Based Learning (PBL) takes real projects as carriers, emphasizing practice-driven learning, problem orientation and achievement implementation. The Genre-Based Approach (GBA) focuses on genre characteristics and communicative functions in specific contexts, and attaches importance to the scenario-based cultivation of students' writing abilities. The combination of the two brings new ideas to the reform of writing courses for Emerging Engineering Education. Therefore, this paper conducts relevant explorations on the integration of PBL and GBA, aiming to promote the better adaptation of writing course teaching to the requirements of Emerging Engineering Education development.

Keywords: Emerging Engineering Education; Writing course; Project-Based Learning (PBL); Genre-Based Approach (GBA); Teaching integration

1. Introduction

Writing, as a key ability that engineering talents must master to deliver technical achievements and conduct cross-domain communication, deserves great attention from universities in the cultivation of writing skills for engineering majors [1]. However, the current teaching of writing courses for Emerging Engineering Education generally faces problems such as the disconnection between theory and practice and rigid teaching models, which make it difficult to truly meet the requirements of Emerging Engineering Education development. Therefore, universities are in urgent need to actively explore new teaching paths for writing courses in response to the construction requirements of Emerging Engineering Education.

2. Core logic of PBL and GBA integration: Adapting to the dual needs of writing courses for Emerging Engineering Education

The core characteristics of writing for Emerging Engineering Education are mainly reflected in scenario-based learning, professionalism, practicality, and collaboration, and its essence is "completing specific communication and practical tasks by using standardized genre forms in the real communicative scenarios of engineering majors" [2]. Based on this, the integration of Project-Based Learning (PBL) and Genre-Based Approach (GBA) in the teaching of writing courses for Emerging Engineering Education has certain adaptability:

On the one hand, at the demand level, it can effectively solve the contradiction of "the disconnection between learning and application". Under the background of Emerging Engineering Education development, the writing of engineering talents is not a simple verbal expression, but a professional communicative behavior deeply bound to scenarios such as engineering design, project application, technology promotion and experimental research [3]. However, traditional GBA teaching focuses more on explaining the genre discourse structure and language norms, which is easy to make students fall into the formal misunderstanding of "learning genres just for the sake of it". Although traditional PBL teaching emphasizes project task-driven learning, it lacks systematic genre methods as support and guarantee, which may easily lead to students' writing achievements meeting project requirements but deviating from professional genre norms [4]. After the integration of the two, GBA can provide a methodological framework and professional genre standards for PBL project writing; PBL can provide real scenarios and practical carriers for GBA genre learning, helping students master the application logic of professional genres in the process of completing projects, thus realizing the seamless connection between "learning" and "application".

On the other hand, at the goal level, it is more in line with the talent training objectives of writing courses for Emerging Engineering Education. From the perspective of Emerging Engineering Education, the teaching objective of writing courses is not to cultivate "professional writers", but to cultivate professional writers with engineering thinking, requiring students to not only understand the core needs of engineering projects but also accurately express engineering intentions by using appropriate genre forms [5]. Specifically, the core teaching objectives of PBL aim to cultivate students' abilities of problem-solving, collaborative inquiry and project implementation, which are consistent with the requirements of writing courses for Emerging Engineering Education to cultivate students' engineering thinking. The core teaching objectives of GBA aim to cultivate students' abilities of discourse analysis, context adaptation and genre creation, which are consistent with the requirements of writing courses for Emerging Engineering Education to cultivate students' professional writing literacy. After the integration of the two, the collaborative cultivation of students' engineering thinking and writing ability can be realized, helping writing become a core tool supporting the learning and future career development of engineering majors.

3. Core principles of PBL and GBA integration: Anchoring the teaching essence of writing courses for Emerging Engineering Education

3.1. Engineering principle: Anchoring real engineering project scenarios

The project carriers of PBL and GBA integrated teaching need to be derived from the real engineering practice of engineering majors, rather than fictional writing tasks. The project design should combine the training directions of different engineering majors (intelligent manufacturing, artificial intelligence, civil engineering, etc.), cover typical engineering writing scenarios such as engineering design, experimental reports, project

proposals, technical specifications, conclusion reports and academic essays, and deeply bind genre learning with engineering practice, so as to ensure that the writing abilities learned by students can be directly transferred to professional learning and future career development [6].

3.2. Genre principle: Highlighting the communicative functions of core genres

The integrated teaching of PBL and GBA should take typical professional genres of engineering as the core content, abandon the "general genre" teaching idea of traditional writing courses, focus on the genre types frequently used by Emerging Engineering Education talents, and put the teaching focus on the "communicative functions of genres" rather than the "formal norms of genres". That is to let students understand "why to write (communicative purpose), who to write for (communicative object), what to write (communicative content) and how to write (genre form)", so as to make them gradually master the adaptation logic of different genres in different engineering scenarios, rather than mechanically memorizing the discourse structure [7].

4. Implementation path of PBL and GBA integration: A three-stage teaching system of "Project Penetration + Genre Embedding"

4.1. Project initiation stage: Context construction + Genre deconstruction, clarifying "What to write and how to write"

The core goal of this stage is to establish the connection between "project demand and genre communicative function", let students clarify the types of writing achievements to be completed based on project tasks, master the core communicative functions, discourse structure and evaluation standards of the genre, and lay a foundation for subsequent project writing [8].

First of all, teachers can select real engineering micro-projects (or simplified real projects) with moderate difficulty, clear boundaries and complete writing tasks in combination with the training objectives and course positioning of the teaching major, and clarify the core objectives, implementation steps, collaboration requirements and the final writing achievement system of the project, so that students can clarify the writing tasks and overall requirements of each stage of the project.

Secondly, teachers need to sort out the high-frequency core genres of engineering in combination with the writing achievement system of the project, sort them according to the timeline of project implementation, and appropriately incorporate general genres required for interdisciplinary collaboration (such as project communication letters and team collaboration reports) in combination with the cross-border characteristics of Emerging Engineering Education [9].

Finally, teachers can use GBA to guide students to complete the in-depth deconstruction of genres. In specific practice, teachers can select excellent professional examples and problematic examples of the genre (both from real engineering scenarios), and let students conduct comparative analysis from four dimensions: communicative functions (why to write, who to write for, what effect to achieve), discourse structure (overall framework, paragraph logic, core modules), linguistic features (professional terms, sentence style, expression norms) and format requirements (typesetting, charts, references, etc.)[10]. Then, teachers need to refine the core writing framework and evaluation standards of the genre, form a visual "genre writing guide", and let students conduct simple imitation of genre fragments to test their mastery of genre norms.

4.2. Project implementation stage: Collaborative inquiry + genre creation, realizing "Learning by doing and writing by practicing"

This stage is the core link of PBL and GBA integration, emphasizing the synchronous progress of project implementation and writing creation. Students need to complete project inquiry, design and implementation in groups, and complete the corresponding genre writing at each stage. As for teachers, they act as guides, consultants and evaluators to provide targeted guidance for students' genre application.

First of all, teachers need to set up project groups in accordance with the principle of "heterogeneous grouping and complementary advantages", with 4–6 students in each group, divide tasks according to students' professional expertise and writing ability, and set task roles such as "project leader, design specialist, experiment specialist, writing specialist, and integration specialist". Among them, the writing specialist is not solely responsible for the writing task, but is responsible for the overall planning and first draft writing of the group's writing; other members are responsible for the content writing of the corresponding modules, and the integration specialist is responsible for the logical sorting and format unification of the final text.

Secondly, teachers need to promote the corresponding genre writing creation synchronously in combination with the timeline and task nodes of project progress. For example, teachers can let students complete the writing of project proposals in the early inquiry stage of the project, focusing on expounding the project background, significance, feasibility and implementation plan with clear genres; in the middle design and implementation stage of the project, let students complete the writing of design specifications and experimental reports synchronously; in the later debugging and optimization stage of the project, students can write technical specifications, focusing on the core functions, operation processes and precautions of products/schemes [11].

Finally, teachers need to carry out hierarchical and classified guidance for the phased writing achievements submitted by each group in combination with the evaluation dimensions of GBA and the progress of project implementation: for common problems (such as incomplete structure of specific genres and non-standard use of professional terms), they can be corrected uniformly through in-class centralized explanation and comparative analysis of examples; for individual problems (such as chaotic logical sorting of the group and missing content of specific modules), targeted guidance can be provided for students through one-on-one Q&A and group discussions, and students are guided to make adjustments according to the actual situation in project implementation, and revise and improve the writing text synchronously, to realize the two-way linkage between project progress and writing optimization [12].

4.3. Project conclusion stage: Achievement integration + diversified evaluation, realizing "integration of learning and application, and promotion of abilities"

The core goal of this stage is to help students complete the dual integration of project achievements and writing achievements, test the teaching effect through a diversified evaluation system, promote the precipitation of students' abilities and the improvement of literacy, and thus provide support for the teaching optimization of writing courses for Emerging Engineering Education in the future [13].

First of all, based on completing the project achievements, teachers can let each group of students systematically integrate the whole-cycle writing achievements, let students sort out the writing texts according to the project implementation logic (early, middle and late stages), led by the integration specialist, the whole group optimizes the logic, format and content of the text, and finally forms a project whole-cycle writing achievement collection and displays the achievements (including genre texts at each stage, modification trace explanations, team collaboration records, etc.) [14].

Secondly, teachers need to build an evaluation system of "student self-evaluation + group mutual evaluation + teacher evaluation + industry feedback" in combination with the process characteristics of PBL and the genre evaluation standards of GBA, to realize "attaching equal importance to process and result, and considering both ability and achievement". Specifically, student self-evaluation needs to focus on students' participation, ability improvement and deficiencies in project collaboration and genre writing. Group mutual evaluation mainly focuses on the genre standardization, content integrity and logical rigor of writing achievements, and conducts quantitative scoring with reference to the "genre writing guide" [15]. Teachers evaluate the quality of project implementation and the level of writing achievements of students, focusing on the application ability of genre norms, the accuracy of professional content expression, problem-solving ability and collaboration ability, and give targeted improvement suggestions. In this process, teachers can also invite enterprise engineering technicians and industry experts to comment on the professional adaptability of students' writing achievements, so as to further strengthen the practical orientation of the achievements.

Finally, teachers need to hold a project conclusion summary meeting, requiring students of each group to display the comprehensive conclusion achievements, share the experience, confusion and gains in project implementation and genre writing, and conduct in-depth analysis of typical cases (excellent achievements, problematic cases, etc.), and refine the key points of PBL and GBA integration and solutions to common problems. At the same time, teachers should guide students to conduct personal reflection, sort out their improvement points in genre mastery and problem-solving, and form a personal reflection report. In addition, teachers should sort out and file the core resources in the teaching process (such as genre writing guides, excellent achievements, problematic cases), and further optimize the guidance strategy of the next round of teaching in combination with students' feedback and teaching effect, to continuously improve the teaching quality of writing courses for Emerging Engineering Education.

5. Conclusion

In summary, under the background of Emerging Engineering Education, the teaching of writing courses can try to integrate Project-Based Learning (PBL) with Genre-Based Approach (GBA) to promote the coordinated development of students' engineering thinking and writing ability. In practice, teachers can build a three-stage integrated teaching system of "project initiation - project implementation - project conclusion", and fully embed the genre analysis, creation and evaluation methods of GBA into each stage of PBL projects, to realize the synchronous development of project progress and genre learning, and the synchronous development of ability cultivation and achievement output.

Disclosure statement

The author declares no conflict of interest.

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