A Study of Computer Teaching Practices Based on Group Intelligence

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Abstract. This paper examines the benefits of open source education, compares the applicability of various platforms, chooses Gitee as a platform to carry out practical computer teaching based on open source, and proposes an evaluation criterion for practical computer teaching based on open source in the context of the challenges of practical computer teaching in military colleges and universities in the new era. A more effective practical teaching outcome was attained.

Keywords: Military colleges and universities · Group wisdom · Open-source education · Teaching practices

1 Introduction

In recent years, demand for the programming ability of military trainees is increasing gradually due to the extensive use of new technologies in military software. To keep up with the rapid development of software technology and adapt to the current situation of weapon and equipment informatization, it is crucial to cultivate trainees' abilities in innovation, engineering practice and teamwork. This poses an urgent and challenging task for the teaching of basic programming courses in military colleges and universities.

This paper relies on the teaching of core courses such as "University Computer Fundamentals", and follows the new software technologies represented by open-source ideas. By combining inquiry-based teaching, this research overcomes the drawbacks of traditional closed curriculum teaching and explores novel teaching concepts and methods based on the Internet open-source platform. This not only has great theoretical significance but also embraces practical application importance since it improves the programming, innovation and engineering practice abilities of students of all levels and types.

The current situation and problems of teaching programming courses in military colleges and universities.

Courses such as "University Computer Fundamentals" are designed to develop students' practical skills and teamwork abilities in solving practical problems using computer programming. In recent years, with various teaching reforms and construction, the software and hardware environment and facilities for basic computer course teaching in various institutions have been significantly improved. Additionally, the frequent use of

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blended teaching and the emphasis on course design practice have improved the quality of teaching and learning results [1].

However, there are several problems in the practice of these courses.

1. Group discussion is not monitored and recorded effectively. In the process of group discussion, some groups and their members actively communicate with the instructor, but there is a lack of effective records of the specific issues discussed in the process, as well as a lack of clear records of the daily work of the group. Besides, students' needs proposed in the communications with instructors are not accurately described, leading to the communications being costly and ineffective.
2. There is a lack of clear division of labor and effective collaboration within the group. Group discussions and course design cultivate participants' engineering teamwork skills, but there is a lack of effective collaboration, clear division of labor and unreasonable time allocation among members of the group due to different levels of ability and responsibility. This leads to a failure to achieve the teaching objectives of teamwork development.
3. The vague criteria of grading lead to a lack of fairness. As it is difficult to track the contribution rate of members within the group, all group members usually get the same score according to the final outcome, making it impossible for more involved members to receive higher grade feedback and for less involved members to also receive the corresponding scores they deserve.
4. It is difficult to record and preserve the process of group discussions and course design, which also makes it difficult to accumulate more teaching experience for reference for future teaching. What students finally hand over to the instructor is usually the result of the discussion and design, and the instructor does not know the discussion process, the actual problems the participants face in the discussion process and the method they use to solve problems. As a result, there is no sufficient accumulation of teaching cases.

2 The Advantages of an Open-Source Platform in Supporting Teaching and Learning

Open source is an open, sharing and collaborative innovation and collaboration model characterized by freedom and openness, common construction and sharing. It is not only about open-source software technology development, but also includes a wider range of open technology fields and the concept and mechanism of collaborative innovation [2]. The open-source model is a method that relies on the Internet platform and achieves continuous innovation by accumulating large-scale group wisdom through common participation and collaboration. By applying this approach, core developers of a project work closely with many peripheral group members to carry out collaborative development, code management and other operations by using the platform with massive sharing resources and the Internet, thereby significantly improving the efficiency of project development and the ability to respond to changes in requirements. Most open-source co-creation sites are code-hosting sites based on distributed version control systems. Open source has the main advantages below in computer teaching practice:

1. In the framework of the open source agreement, students in the open source group open source codes through the platforms, so other students can see the open source codes, and can copy these codes to their local facilities for use and modification. This allows for joint improvement in the development of open-source projects or the solution of problems, as well as for better collaboration and sharing in project practice.
2. The function of continuous checking based on the version management of the open-source platform, can achieve engineering iterative process records. Cultivation of engineering programming ability is a gradual process, and it is difficult to make students complete tasks and submit high-quality practice results through one-time course practice. In the group discussions under the traditional course practice, students often have doubts about whether the work developed by the group is mature enough, what problems exist, and how to improve it. The open-source platform provides a step-by-step approach to practice, dividing software development practice into multiple iterations for students to complete incrementally Each iteration assigns students with limited and clear goals, and the next iteration is built on the previous one. This ensures that the entire course practice is carried out in a step-by-step and orderly manner, and throughout the whole course of teaching.
3. The continuous checking function based on the open source platform version management can also achieve continuous evaluation and counseling of practical assignments and improve practice. Besides, it can conduct targeted evaluation and analysis of the results submitted by students in each iteration (such as models, codes and documents). The high openness and freedom of open source enable better sharing and development of knowledge, reduce the cost of learning, reuse and improvement, and break the technology blockade.
4. Teaching evaluation based on the open-source platform is relatively easy because using process data as the basis for evaluation help teachers to complete the teaching evaluation easily. For example, the evaluation score can be determined based on the number of codes, discussions, bug modifications and submitted by students as well as the code quality. It is also possible to visualize the specific situation and problems of the students by using the open source website through the visual statistical chart function provided by the open source website.

To sum up, practical teaching on the open-source platform can effectively meet the development requirements, record the discussion and implementation process, and realize contribution rate statistics and objective teaching evaluation. It can record the whole life cycle of course design and meet the needs of course improvement [3].

3 Teaching Practice Based on Open Source Platform

According to the advantages and trends of open-source platform-assisted teaching, this paper highlights the fundamental goal of military personnel training in military colleges and universities and clarifies the basic principles of using open-source platform-assisted teaching in military colleges and universities by combining the characteristics of military colleges and universities.

Table 1. Comparison of the applicability of well-known open source platforms

Platform name	quantity of open source projects	teaching assistance	Chinese Support	servers
Github	Extremely	Yes	No	Slow
Gitlab	Many	No	No	Slow
Jihu-Gitlab	Many	Yes	Some	Quick
Gitee	More	Yes	Yes	Quick

1. The open-source community should be fully leveraged to achieve iterative development. The practical teaching platform collects the problems, problem-solving methods and software development experience encountered by each class of students carrying out course practice, and students can also share this wisdom to facilitate the solution of related problems. To apply an iterative approach to course practice, students are required to complete the entire course practice task in several iterations throughout the course practice, and each iteration focuses on different perspectives and evaluation requirements [4].
2. The open-source software should be reused to encourage secondary creation. The course practice encourages students to go to open-source software hosting sites to find open-source software that supports their key requirements based on their conceived software needs and integrate them into the software projects throughout the course practice. At the same time, it is suggested to encourage students to do creative course practice, refer to the work of previous students and the wisdom and experience of the group. In this way, they can put forward new requirements for software needs and improve the quality of previous work.
3. Military colleges and universities should focus on the integration and sharing of military and civilian resources. Military colleges and universities should focus on drawing on the experience of mature open-source teaching cases and excellent education and teaching resources from local universities, selectively absorb and apply them in combination with the military personnel training needs, and construct computer courses.

Gitee Code Cloud was chosen as an open source teaching aid platform tool to build an open source platform-based education practice for military colleges and universities after weighing the benefits and drawbacks of each open source platform and taking into account the needs of military colleges and universities for domestic autonomous controllability. Table 1 shows the comparison.

4 Designing the Integration of Open-Source Teaching and Learning in Basic Computing Courses

The project team compared various open source websites and found that Github is the world's most influential and largest source code repository website, but there are issues such as unstable foreign servers and difficulty understanding the language. Considering

the localization alternative and students' learning situation, we decided to use Gitee, a domestic open source code repository website.

The learning outcomes in introductory computer courses are mostly dependent on software work and discussion assignments, and modern classroom teaching is primarily implemented through problem analysis and solution [5]. The format typically consists of conversations based on language, presentations based on research, lecture reports based on work, and papers, assignments, and assessments based on text. When the aforementioned analysis is combined, the teaching format can be created suitably in class discussions, group project inquiry reports, etc. after the incorporation of open source ideas in practical teaching. Additionally, it can interact with the pre- and post-course preview and post-course review and realize the extension from class to before and after class. There are several phases to the implementation of instruction [6]:

1. Establish specifications and post the issue on the Gitee platform. The prerequisites and the issues that must be resolved will be made public by the teacher. Understanding the intermediate complexity of the issues—which shouldn't be too simple or too difficult—and advocating somewhat hard challenges are essential when developing the standards.
2. Collaborative research and useful analysis. Under the direction of the requirements, participants should collaborate with students or groups on the Gitee platform to accomplish the necessary solutions and examine the benefits and drawbacks of such solutions. Encourage pupils to think critically and to ask questions.
3. Practical research and supporting reasoning. This stage is to assist students in mastering the iterative development approach on the Gitee platform by consolidating the inquiry findings and testing the inquiry impact. Students should be encouraged to participate in the investigation, and the instructor should urge them to apply the information they have acquired from self-study and discussion of the investigation to name one example in order to analyze a project solution that has flaws and to emphasize the idea that practice makes perfect knowledge.
4. Encourage examination and provide an investigation summary. Group assignments for the class to create a summary presentation, this stage is not only to summarize the main benefits of the first three steps, to fully recognize the active participation of students in the inquiry, to draw conclusions, but also to summarize the ideas of inquiry for students to solve similar or related problems in the future, to further allow participants to summarize the inquiry methods used in learning, and to develop the habit of independent inquiring.The learning and practice plan is shown in Fig. 1.

The iterative process assessment of engineering is studied based on the functions of version management and continuous inspection of the open source platform. Relying on the functions of open source platform version management and continuous checking to achieve continuous evaluation and counseling of practical assignments and improvement practices, the results (such as models, codes, documents, etc.) submitted by students for each iteration are assessed and analyzed in a targeted manner. The scoring criteria in the in-class group practice are completed by each student's participation in scoring, based on the reference standards shown in Table 2.

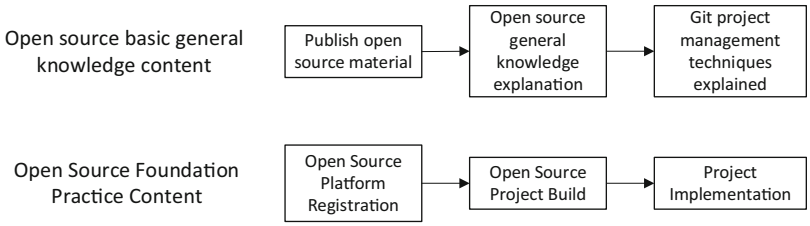

Fig. 1. The learning and practice plan

Table 2. Engineering iterative process assessment reference standards

Evaluation Indicators	Evaluation Criteria	Score Ratio
Practical value	Whether the use of computational thinking can solve real-world problems	40%
Code size	100 lines are full score	20%
Development documentation is good	Development documentation is good	15%
Iterative workload	Collaborative, good development	15%

5 Conclusions

Practice has revealed that shifts using the Gitee open source platform-based teaching practice outperformed courses using traditional teaching in terms of course design. The average number of lines of code went from 40 to 80, and students' confidence in their ability to execute development and creation increased from 30% to 60%.

The teaching practice based on the open source platform is a modern and autonomous teaching practice process. It can help students to better understand the knowledge system of the whole course, exercise the ability to apply the knowledge and methods of this course to solve complex practical problems, and gain good engineering training and design and cooperation skills. The practice shows that compared with the traditional teaching methods, the inquiry-based teaching mode based on the open-source platform significantly improves students' participation rate, and enhances students' cognition of relevant knowledge and skills. This new teaching approach can effectively improve the innovation and practice ability of students in the context of the new era and is of great significance in cultivating high-quality creative talents.

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