

Android application development teaching reform based on innovation ability training

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Abstract. Under the background of training and construction of innovative talents in new engineering, taking the Android application development course of Internet of things engineering in our university as an example, this paper explores the innovative ability training mode of programming application development courses under the background of new engineering from five aspects: project-based course teaching, enterprise training, competition driving, development project inspection and improvement, and diversified assessment methods, Gradually formed a "five in one" new teaching mode of two wheel drive. After two years of teaching reform practice, it has achieved obvious reform results from the aspects of students' learning enthusiasm, students' participation in competition and project development ability, and achieved the teaching effect of cultivating innovative ability.

Keywords: New engineering, Innovation ability, Five in one teaching mode, Reform in education.

1 Introduction

The Internet of Things engineering major is one of the typical new engineering majors. This major has the characteristics of computer science and technology, communication engineering, software engineering and other majors. This major has a typical interdisciplinary nature. Android application development is a professional elective course for the undergraduate major of Internet of Things Engineering in our college. If it is said that the bottom layer of the Internet of Things project realizes the connection of all things, the upper application side will mostly have a human-computer interaction interface, and the mobile application side is an important way of realizing human-computer interaction. Mobile application development based on Android technology is an important mobile application implementation. In the actual employment of students after graduation, working in Android application development positions is an important choice for students' employment. Therefore, this course occupies a very important position in the Internet of Things engineering major. This course requires students to be able to master the construction, configuration and program debugging methods of the Android development environment; master the development methods of the four major Android components and

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interface components, as well as the use of resources and data access; familiarity with Android multimedia, network communication, and database development technologies ; Familiar with the typical Android development framework, able to comprehensively use the knowledge points learned to innovatively develop small and medium-sized mobile applications ^[1-2] .

2 Current situation and deficiencies

The traditional teaching method of this course has the following deficiencies: First, it emphasizes theory and ignores application. This course is a software development course, and the realization of the course teaching objectives depends on cultivating students with good mobile application design ability. Under the 4 class hours per week, if there are too many theoretical explanations, students will have less experimental hours, and it is difficult to improve their programming ability. Too much emphasis on theoretical explanation is also a common problem in many current software courses. On the one hand, the reason is that teachers' teaching methods are old-fashioned, and they are accustomed to the theoretical cramming method of teaching. On the other hand, Android development technology is changing with each passing day, and the version iteration is relatively fast, which requires relatively high application development capabilities of teaching teachers. The second is the lack of systematic design of the experimental project, and the singleness of the evaluation of the experimental results. In traditional Android teaching, the course experiment projects are too scattered, mainly from the specific realization of knowledge points, there are too many verification experiments, and there are not enough independent innovation experiments. Capacity is insufficient. Moreover, most of the time, the assessment of course experiments still stays in the writing of paper experimental reports, which takes up a lot of time for students to write paper experimental reports with little practical significance, ignoring the cultivation of students' ability to actually develop and debug programs. Third, the course assessment method is single. The main assessment of the course is the paper-based written test accounting for 70%, and the curriculum design, daily experiments and attendance accounting for 30%. Curriculum assessment is the baton and touchstone for the realization of curriculum teaching objectives, which directly determines whether the curriculum teaching objectives can be better achieved. Unreasonable course assessment methods cannot make course teaching, course assessment, students' learning enthusiasm improve, and students' innovative ability training to form a benign closed loop. Therefore, a good course assessment method should be able to better reflect the positive correlation between applied knowledge and practical development ability.

With the increasing demand for practical application development, the current teaching of Android application development courses is not conducive to improving students' ability to solve complex engineering problems and cultivating students' innovative ability. Therefore, under the background of new engineering construction, taking the basic requirements of building first-class undergraduate courses as an opportunity and cultivating students' innovative ability as the starting point, under the background of the construction of Internet of Things engineering majors in application-oriented universities, it is very necessary to carry out the teaching reform of Android application development courses.

3 Curriculum teaching reform measures

3.1 Adjust theoretical and practical class hours

This course has strong applicability. Based on this, starting from the 2020 level training

method, the course hours are changed from the original 2+2 to 1+3. Android development is similar to Java language programming. After learning Java, the theoretical hours of this course can be reduced, so that more hours can be adjusted to experiments, leaving enough time for students to experiment and exchange and evaluate experimental projects. In view of the extensive use of this course in academic competitions, the starting semester will be moved from the 5th semester to the 3rd semester.

3.2 Project-based (PBL) teaching

The essence of project teaching is a teaching mode based on constructivism. Constructivism and project teaching both emphasize "learning by doing" and emphasize collaborative learning to complete the learning process in the process of solving problems. Change the construction standard of the curriculum from "what to teach" for teachers to "what to learn" for students. Through the project method, students' learning ability and learning effect are improved, and students' practical application development ability and independent innovation ability are cultivated in the project^[3-4]. As shown in Table 1, some teaching experimental cases are designed in combination with the main teaching knowledge points of this course.

Table 1. Course experiment case design.

Serial number	Experiment name	Knowledge points involved
1	User registration interface	Activity, Layout, Common component
2	Telephone, SMS and email functions	Activity, intent, authority, etc
3	Weather forecast notice	Broadcasting and service
4	Simple music player	Activity, service, control, data storage, etc
5	News clien	Fragment, control, etc
6	LAN communication software	Network communication, etc
7	library system	Android + MySQL integrated application
8	Electronic ordering system	Android + MySQL integrated application

3.3 Insist on competition-driven

In 2019, our school revised the document on the award and management methods of the discipline competition, and readjusted the level of the relevant discipline competition. Based on this policy document and in combination with the characteristics of this course, we have formulated subject competitions that are highly relevant to this course and can be mainly participated in, as shown in Table 2.

Our college has established extracurricular learning organizations such as the Internet of Things Association and the Extracurricular Characteristic Craftsman Production Group. The Internet of Things Association and other extracurricular learning organizations are established for subject competitions. The author of this article is the responsible teacher of the Internet of Things Association of the college. By arranging the annual competition plan, excellent students are selected in the association to cultivate and develop competition projects. The competition team is mainly composed of juniors and sophomores, taking into account the active freshmen and seniors with rich competition experience. Gradually cultivate and form research echelons and competition project resource pools in the association. Through continuous in-depth research on old and new projects, students are more motivated to participate in discipline competitions, providing training for university-level, provincial-level, national-level discipline competitions, and innovation and entrepreneurship training for college students. Planned (SRT) projects provide a steady

stream of back-up students and project support that feed back into course teaching. Since students can participate in association competitions in their freshman year, when they study the Android application development course in their sophomore year, some students already have basic knowledge of program development, form a connection with the course study, and have the opportunity to win the competition in the course study semester Scores or obtain SRT programs at or above the school level. The flow chart of the competition-driven teaching organization mode is shown in Figure 1.

Table 2. Competition statistics related to the course.

Serial Number	Course related competitions	Registration time	Grade
1	Internet plus competition	April	A
2	Create youth competition	March	B
3	Challenge Cup competition	Odd years, March	B
4	China University computer competition (mobile application innovation competition)	March to May	C
5	Software Cup Undergraduate software design competition	March	D
6	China University computer competition	March to June	C
7	National University Internet of things Design Competition	March to June	D
8	Application for national innovation projects	May to June	-
9	Danei "discovery Cup" software design competition	September	D
10	Shandong University Student Science and technology innovation competition	November	D
11	School level SRT project application	November	-
12	Shandong college students' mobile Internet innovation and Entrepreneurship Competition	April to October	D

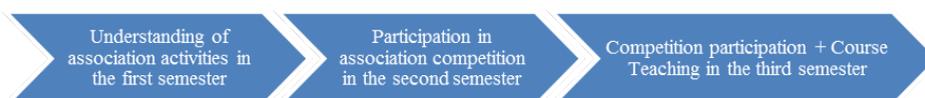


Fig. 1. Competition driven teaching flow chart.

If students obtain academic competition awards during the course study, they can get corresponding bonus points in the course grades according to the competition award level. Disciplinary competitions are distributed throughout the year, and course teaching is completed in the last semester of the sophomore year. Based on the teaching organization form organized by the after-school competition association that echoes the course learning, it can better solve the problem of mismatch between the subject competition and course study time, and increase the number of students. The enthusiasm for learning enables students to study with competition project tasks, with clearer learning goals and motivation^[5]. At the same time, learning in the association can also increase the interaction and communication with teachers, and exercise students' ability of independent learning and teamwork.

3.4 Actively introduce enterprise training

In 2020, our school proposes a policy of full coverage of school-enterprise cooperation for undergraduate majors to cultivate applied talents. The Internet of Things Engineering major actively signs cooperation agreements with relevant companies. Currently, it has established cooperation with Qingdao Yinggu, Beijing Qianfeng Internet Technology, Dane

Technology and other companies. Professional apprenticeships, internships, corporate teaching, competition guidance and other cooperation methods. In 2020 and 2021 , Qingdao Yinggu and Beijing Qianfeng have respectively taught application courses such as Android project actual combat and JavaWeb programming for IoT engineering majors , mainly in the form of centralized training. Android project combat is the follow-up project-based practical course of Android application development. The two courses of Android run through the application development specifications of the front-end, back-end and database of mobile application project development, and apply the typical Android development framework to actual project development. Improve students' project development ability^[6].

3.5 Appropriate integration into faculty research projects

In order to exercise students' project development ability, functionally decompose the research content of municipal-level smart agricultural applied scientific research topics obtained by teachers, and lead groups of students to develop smart agricultural information management software, rural public health service software, crop disease and insect pest detection software, etc. Carry out exploratory development and successfully obtain three university student innovation plan (SRT) projects.

3.6 Explore diversified curriculum assessment methods

Course assessment is a direct way to test the effect of course teaching. Students' course performance is the basic basis for students' various evaluations. To a certain extent, this is the most direct driving force for all students to learn. Therefore, course assessment is the direct baton of course teaching effect. Without a suitable assessment method, all the previous teaching reform measures will lose their sustainability. Therefore, the reform of the teaching mode should not avoid the reform of the curriculum assessment method. In order to reflect the OBE outcome-oriented course teaching objectives, the traditional paper-based paper-based examinations are cancelled in the teaching assessment of this course, and more emphasis is placed on the learning process assessment and the learning effect output orientation. The specific course assessment elements are given in Table 3.

Table 3. Course assessment elements and components.

Total score (100%)				
Usual score (60%)				Course design and reply score (40%)
Normal experiment (50%)	Related competition (20%)	Project participation (10%)	Classroom performance (20%)	Workload and innovation of topic selection (50%) + personal workload and defense effect (50%)

As can be seen from the table, the course assessment pays more attention to the learning process. In Android teaching, the writing of traditional experimental reports is canceled, and students are released from stacked homework. In the end, all project experiments in the classroom only submit the electronic version of the experimental source code and self-summary of the experiment. Teachers try to complete the experimental results in class as much as possible. Acceptance and give graded experimental results, so as to urge students to complete the experiments with high quality and timely. Android-related subject competitions are divided into three grades according to school-level, provincial-level, and national-level competition awards, and the specific bonus range is determined by the award-winning grades. Project participation is mainly reflected by the school-level and provincial-level national SRT projects and teachers' participation in scientific research projects. In the test room performance, 50% of the attendance is on time, and the students

who are active in the classroom experiment, especially those who can lead the experiment and assist other groups of students to carry out experiments and solve problems, can highlight the other 50% bonus points. Course design topics and groupings are arranged in the semester. Generally, each group has no more than 3 people. According to the topics they choose, they will learn and do in the second half of the semester. The course defense is organized at the end of the semester. The total grade of the course is composed of two parts: group grades and individual grades. During the course design, students can exercise their ability to solve practical problems, language expression and teamwork.

4 Teaching reform effect

Through the implementation of the above curriculum reform measures, classroom teaching has finally formed a closed-loop teaching mode of "five-in-one" two-wheel drive, which is based on classroom project-based (PBL) teaching, corporate training, competition-driven, project inspection, and diversified assessment. In the past two semesters of teaching, the enthusiasm of students in class has been significantly improved, and the learning objectives have paid more attention to the application of actual needs. In the past two academic years, 5 school-level SRT projects related to courses, 1 provincial-level SRT, 1 third prize in Shandong Mobile Internet Innovation Competition, 1 third prize in Shandong Software Design Competition, and Shandong Science and Technology Innovation Competition 3 school-level third prizes, etc.

5 Summary

Under the background of new engineering construction, the cultivation of students' innovative thinking and innovative ability is very important. This paper explores a sustainable and replicable new model for the cultivation of innovative talents. Through two academic years of teaching practice, students' innovative ability has been well exercised and improved, which enhances students' ability to apply development and solve complex engineering problems.

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