

The Construction and Application of Smart Class Teaching with Financial Features: Taking Guangxi University of Finance and Economics as an Example

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Education reformation project: Smart classroom under the background of Education Informatization 2.0 in classroom teaching reform in Guangxi colleges and universities-practice research with Guangxi University of Finance and Economics as an example

Abstract: Under the guidance of Education Informatization 2.0 with the policy background of “prioritizing the development of education, speed up the education modernization, and build an education powerhouse”, major universities have responded to the policy, and built a batch of smart classrooms in line with the development of university teaching, laying a solid foundation for promoting university teaching reformation. The author complied the necessity of smart classroom construction from the theoretical level, as well as the current construction status of the smart classroom at home and abroad, and finally, this paper takes Guangxi University of Finance and Economics as an example to analyze the teaching advantages of the school, how to promote the deep integration of information technology in education and teaching, and put forward a powerful plan for the construction of the smart classroom in school teaching, and the practical application of group discussion in smart classroom as an example to discuss the smart teaching. This kind of classroom teaching will provide a reference for leaders, students and teachers.

Keywords: Smart classroom; Financial and economic features; Construction; Application

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1 Introduction

In April 2018, the Ministry of Education issued a notice on the “Education Informatization 2.0 Action Plan”, clearly stating that the need to accelerate the modernization of education and the construction of an education powerhouse and promote the development of education informatization in the new era. The notice pointed out the “smart education innovation and development action” to build an intelligent learning support environment. We will vigorously promote smart education, carry out the construction of learner-centred smart teaching support environment. Besides, we will explore the construction and application mode of new ubiquitous, flexible and smart education and teaching environment, and accelerate the reformation of talent training mode and teaching methods^[1]. How to promote the deep integration of information technology and education and teaching, to promote the development of high-level undergraduate education in schools?

2 Current research on smart classrooms

Teaching-based smart classrooms will be able to meet a variety of teaching modes, thus teachers and students will be able to apply more personalized learning based on big educational data. With the help of new technologies such as cloud computing, big data analysis, and intelligent information processing, teachers and students can use computer terminals and mobile apps to identify themselves, ask questions, display content

on multiple screens, and submit assignments during class, thus improving the teaching efficiency. The comprehensive teacher-student interactive environment of the smart classroom can also build an organized learning community, give full play to their respective strengths in cooperative inquiry and collaborative learning, and cultivate cooperative skills and future leadership.

At the same time, the smart classrooms can encourage the use of the Internet, big data and other modern technologies in teaching, explore the implementation of networked, digital, intelligent and personalized education, promote the formation of a new form of “Internet + higher education”, and promote the development of high-level undergraduate education in the university with modern information technology.

A smart classroom is a form of the digital and future classroom, with a new form of education and modern teaching means, based on the Internet of Things technology set intelligent teaching. Environment intelligent adjustment in one of the new modern smart

classroom system is to promote the construction of a future school and effective classroom teaching[2-3]. Through smart classroom teaching, this enables students to experience interactive classroom teaching by teachers and students, achieve better-personalized teaching experience, enhance students’ learning ability, and promote the formation of students’ core literacy.

2.1 Current status of foreign research

Foreign schools and scholars have mainly studied the smart classroom model from two aspects, as shown in Table 1.

2.2 Current status of domestic research

In recent years, the construction of domestic smart classrooms is booming, especially the construction of dual-class universities, which needs the support of smart classrooms. The author collected and organized the construction and application research of smart classrooms in domestic universities, as shown in Table 2.

Table 1. Research by foreign schools and scholars on the smart classroom model.

Research Direction	School or Scholar	Research Content	Findings
The role of technology and devices in facilitating learning in the smart classroom	Arizona State University and DePaul University	Developed automated note-taking class and group learning communication tools from student perspectives.	Improves student learning efficiency and promotes communication and cooperative learning.
	Matt Rappt et al. [4]	Use of wireless smart devices.	Increasing student participation in classroom learning.
	Skipton et al. [5]	Propose smart classrooms, i.e., electronically or technologically enhanced classrooms	Increased student focus.
Designing new teaching models for smart classroom learning environments	University of Reading, UK	Student interaction behaviour in the classroom was studied based on a self-constructed smart classroom.	Determined if smart classrooms enhance the learning experience.
	James D.Slotta [6]	A collaborative malefactor’s model of teaching knowledge communities is proposed.	The model used collaborative learning tasks as the backbone of course learning, thus allowing students to solve learning problems through active interaction.

Table 2. Construction and application research of wisdom classroom in domestic universities

Research direction	Schools or Scholars	Research Content	Findings
Class teaching as a breakthrough	Sichuan University	Proposed “Hand-on inquiry and small classroom-based” teaching model.	The multi-screen seminar classroom, mobile phone interactive classroom, flexible seminar classroom, etc., combined with different intelligent teaching environment, have successfully created the teaching mode with the characteristics of Sichuan University.
Promoting interactive, collaborative and self-disciplinary in smart classroom teaching	Weidong Chen, Jiping Zhang et al. [7]	Encouraging the student to be self-exploratory, interactive and collaborative in teaching model, construct a future integrative teaching model.	Training students with 21 st -century skills such as being collaborative, interactive, and innovative.
	Xiaoshan Guo et al. [8]	Proposed four smart teaching models with the focus on students.	Construction of blended teaching model.
	Weixing Hu et al. [9]	Proposed multi models of smart classroom teaching.	Lecturing, small group collaborative learning and virtual teaching models.

To combine the features of the professional courses of Guangxi University of Finance and Economics, the university should seize the characteristics of the school's education and teaching, transform the teaching mode of teachers, promote the deep integration of information technology and education and teaching, and build a teaching intelligent classroom with financial features. These are worthy of our in-depth research and discussion.

3 Teaching advantages and problems with financial and economic features.

3.1 Pedagogical advantages

Guangxi University of Finance and Economics has 11 majors in economics, 24 majors in management, 6 majors in literature, 4 majors in engineering, 3 majors in art, 2 majors in science and 1 major in law, forming a professional layout with economics and management majors as the main subjects and coordinated development of multi-disciplinary majors in economics, management, literature, law, science, engineering and art. According to the current situation of regional economic and social development, the positioning and characteristics of school running, and the disciplinary foundation and service areas, the university has built 9 groups of majors such as economy and trade, finance, business administration, accounting, management science and engineering, culture and art, agriculture and forestry economic management, e-commerce and information technology. Besides, 7 advantageous majors such as accounting, 16 characteristic majors such as auditing, 9 characteristic majors such as logistics management and so on are established. In the past three years, the university has established a competitive professional system that meets the university's development goals, adapts to the needs of national and local economic and social development, and is oriented to future development.

In the past three years, the university has built 23 professional laboratories in accounting, modern finance and investment, finance and taxation informatization, e-commerce, ERP, engineering costing and so on, relying on the construction of national experimental teaching demonstration centre of economy and management.

3.2 Problems

3.2.1 Some teachers' teaching methods are outdated,

and there is little seminars in teaching for teachers

Only a few majors have completed experimental courses in the laboratory, and most courses are taught in ordinary multimedia classrooms. Neat tables and chairs, ordinary projection, and large class teaching have seriously affected the development of deep integration of information technology and curriculum. The ordinary multimedia classroom cannot motivate students to interact and communicate with each other. For example, in advertising, the course of learning film and television production includes not only the explanation of on-site shooting but also the demonstration of filming equipment to students.

In Business English, the focus of students' training is their ability to translate and express themselves. If the classroom teaching method is still "full-fledged" and "injected", it will seriously affect students' learning and communication ability.

Marketing students need an open teaching environment, as well as a simulated market environment, in which they can organize and plan their marketing presentations.

Due to various reasons, some teachers' teaching methods are outdated. There are little seminars about teaching, and the interaction between teachers and students is insufficient and of low quality. Besides, some students have a weak sense of independent learning. The teacher-student extracurricular communication and tutoring are not sufficient too.

Therefore, it is necessary to promote classroom teaching reformation, encourage teachers to introduce modern information technology into classroom teaching, and promote teachers to carry out in-depth information-based education teaching reformation, including micro-classes, curtain classes, flipped classrooms, and the application of seminar teaching methods. Therefore, it is of great importance in encouraging students to actively carry out independent learning based on education information technology, strengthening the main role of students in classroom teaching, focusing on heuristic education, and fully encouraging students' enthusiasm to participate in classroom teaching.

3.2.2 The construction of high-level undergraduate education contradicts the shortage of smart classrooms and promotes the acceleration of the construction of smart classrooms

The Ministry of Education put forward the idea of “accelerating the construction of high-level undergraduate education and comprehensively improving the talent cultivation capacity”, which promotes the deep integration of modern information technology with education and teaching, and creates smart classrooms, smart labs and smart campuses that adapt to the needs of students’ independent learning, management and service.

Nevertheless, the school’s current lack of class classroom status quo and teacher teaching reformation needs, urgently reflect the need to accelerate the pace of smart classroom construction, especially in recent years the flipped classroom, micro-classroom, class in the field of education applications to achieve linear growth. The traditional multimedia classroom, organized tables and chairs and a single projection, and intelligent teaching environment is incongruous, which seriously affects the process of education modernization. The

construction and the use of the smart classroom will gradually solve these problems.

Therefore, the construction of smart classrooms not only meets the needs of school development but also plays an important role in exploring the teaching effect in the smart classroom environment, creating new highlights of teaching with financial and economic features, as well as promoting education informatization and realizing the deep integration of information technology with education and teaching, with continuously achieve the goal of education modernization.

4 Analysis of the construction of teaching-type smart classrooms

4.1 Functional requirements for instructional smart classrooms

Table 3. Functional requirements and analysis of the smart classroom

Serial Number	Functional Requirements	Functional Requirements Analysis
1	Intelligent environmental management	The main functions include environment perception, equipment control, and an electronic class board. It is also a good way to create a comfortable learning environment by breaking the traditional arrangement of tables and chairs. The first step is to create a new environment for the students. The new system will be installed on the wall of the building. The new system will be able to provide a variety of functions such as student check-in, class schedule inquiry, classroom usage inquiry, campus information notification, and class-related display.
2	Appointment Management	The reservation management function of a smart classroom can mainly operate in the self-servicing, flexible reservation of classrooms, courses and activities, online approval, and the whole digital processing.
3	Interactive Classroom	Interactive classroom teaching is one of the core functions of a smart classroom. It is also a great way to get the best out of the classroom. It can be used for group interaction, classroom quizzes, pop-ups, and student evaluations. The students can answer the questions online and give feedback to the teacher directly. It is also easy for students to evaluate the teacher online.
4	Collection of records of the teaching process	The recording system of a smart classroom can record the whole teaching process of the teacher, and the recorded content can be played back instantly, as well as downloaded and copied. Besides, the recording and broadcasting system can also broadcast live teaching, ensure the synchronous live broadcast in different places.
5	Discussion and inquiry-based learning	Inquiry-based learning is the main way of learning to date, and it takes place in smart classrooms, enabling online learning, self-directed learning, discussion and communication, and scenario-based learning.
6	Resource management	Resource management in the smart classroom includes resource building, management of teaching spaces, smart pushing of resources, and resource sharing.
7	Data analysis	Applying smart classrooms for teaching and learning enables the collection of a variety of data so that the collected data can be analyzed, including AI classroom behaviour analysis, assessment analysis, resource usage analysis, teaching effectiveness analysis, equipment usage analysis, and so on.
8	Remote Interaction	Smart classroom’s remote interaction feature enables off-site communication, multi-screen scenario interaction, and simulated teaching. Inviting experts, or multiple campuses for synchronous teaching, academic lectures, etc., enables online interaction.
9	Teaching Supervision	The application of smart classrooms enables real-time supervision, retrospective supervision, group supervision, and statistical analysis, replacing the traditional methods of teaching supervisors sitting in classrooms and listening to lessons.
10	Security Management	The security management of the smart classroom mainly includes access control and security monitoring functions. Accessing control, teachers can use fingerprint unlocking. Thus, security monitoring, which mainly includes real-time monitoring of the application of classroom devices after class can be applied.

4.2 Functional systems for smart classroom teaching

According to the functional requirements analysis of the instructional smart classroom, smart classroom construction should include the following functional systems.

4.2.1 Multimedia audio-visual systems with high-quality effects

Common multimedia audio-visual systems are still stuck in the combination of handheld microphones and common amplifiers. With the increase in the usage numbers and different usage of microphone among each teacher, this results in poor contact, damage to the handheld microphone, thus consequences are unclear, intermittent sound problems.

The smart classroom quality effects of multimedia audio-visual systems, to replace the handheld microphone with a ceiling microphone, thus solving the problem of damage. With the addition of high-quality amplifiers and sound equipment, the sound will be clearer and more definite.

4.2.2 The voting system for answering questions

How to improve the interaction between teachers and students in the classroom is a topic that frontline teachers have been studying. In the process of building smart classrooms, the introduction of question-answering and voting systems can not only motivate students in a class, but also attract their attention. Besides, by answering questions and voting, teachers can quickly grasp students' learning situation and thus adjusting the teaching progress.

4.2.3 Wireless sharing system

The wireless sharing system enables the sharing of teaching resources. Teachers can share relevant teaching materials with students before class, including teaching materials and micro-lessons, thus students can prepare in advance. In the classroom, teachers can share their teaching materials on the spot, not only to students' desktop computers but also to their mobile phones. After the class, students complete teaching assignments and share them through the wireless sharing system, which enables students and teachers to assess each other's works.

4.2.4 Cloud Recording System

The cloud recording system can mainly enable the whole recording of the teaching process, and the

recorded video can reach high-definition requirements and can be instantly on-demand at any time to the recorded content, download and other functions.

4.2.5 Online Supervision System

Online supervision system enables real-time observation of classrooms, teachers, and students in progress. The teaching supervisor directly completes the online evaluation of the teacher's teaching process and other contents. Moreover, they can conduct statistical analysis of students' learning situation.

4.2.6 Attendance System

The attendance system in the smart classroom, which is directly connected to the electronic class board, allows students to take fingerprints before entering the classroom, or to take attendance electronically on their mobile phones through the teaching software. Teachers will be able to observe attendance on time.

4.2.7 Memory whiteboard

An interactive whiteboard can communicate information with a computer, connect the whiteboard to the computer, and use a projector to project the contents of the computer onto the whiteboard screen, and with the support of specialized applications, a large-screen, interactive collaborative meeting or teaching environment can be constructed.

Using a specific positioning pen instead of a mouse on the whiteboard, any application can be run, and documents can be edited, annotated, saved, and any other operation that can be performed on a computer using a keyboard and mouse.

The memory whiteboard, based on the interactive whiteboard, is capable of storing the content of the teaching process automatically.

4.2.8 A fresh air control system

Since the classroom is a relatively closed environment, when the number of students reaches a certain number, the indoor carbon dioxide will continue to increase. When the carbon dioxide reaches a certain value, this will affect the mood of students, resulting in a state of lethargy.

A fresh air control system, which monitors the temperature, humidity and carbon dioxide concentration in the room, detects the real-time temperature value, humidity value and carbon dioxide concentration value in the room through sensors and inputs this monitoring signal to the controller. Then, the parameters exceeding the constant values are controlled in real-time. Thus, the

temperature, humidity and carbon dioxide concentration values are always kept in a constant range to create a conducive and efficient teaching environment.

4.2.9 Classroom Condition System

The classroom condition system of a smart classroom can mainly realize the overall supervision of the classroom, including the control of lighting, air conditioning switch, and the management of multimedia equipment. Secondly, it can arrange for the class schedule inquiry, classroom usage inquiry, class-related display, and other functions.

5 Construction model of teaching-type class classrooms with financial and economic features

At present, the construction of smart classrooms in domestic universities has gradually matured. Many colleges and universities apply smart classroom for classroom teaching reformation, and the results are remarkable. The author combines the professional settings of Guangxi University of Finance and Economics, mainly from the inquiry type wisdom classroom, multi-screen display type wisdom classroom, group discussion type wisdom classroom three examples for analysis, to provide reference suggestions for the construction of wisdom classroom.

5.1 Inquisitive Smart Classroom

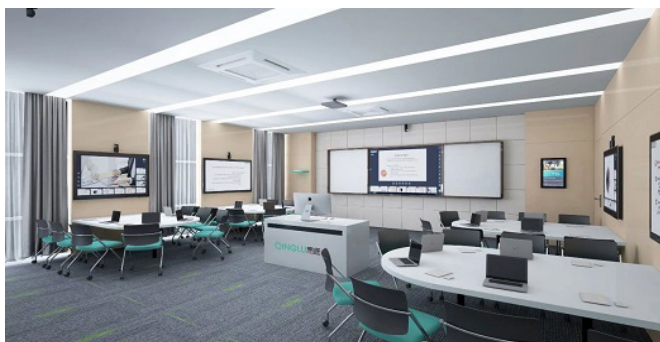


Figure 1. View of an inquiry-based smart classroom (Source: Baidu image).

As an important way to explore the quality of student development, inquiry-based teaching helps to inspire students to explore the unknown. The inquiry-based classroom teaching model is to form a problem situation, which in turn leads to problem identification, investigation and problem solving, thus cultivating students' sense of exploration[10-11]. The inquiry-based smart classroom is mainly used for students to investigate on their own so that they can learn. As

shown in Figure 1, the inquiry-based smart classroom is built with mainly circular tables with movable chairs. The teacher creates a context in the classroom to elicit questions, thus allowing students to think on their own. During the learning process, students can apply the desktop computer and access the teaching resource library as well as the network at any time to explore and solve problems based on the problems identified. Such as economics and trade, business administration and other professional courses teaching, is more suitable for the inquiry-type wisdom classroom.

The main role that the inquiry smart classroom can play is: Firstly, teachers can easily and quickly be combined with the smart classroom environment, create a teaching context, guide students into the context, independent inquiry learning; Secondly, students can always access teaching resource library or network resources, for research problems and problem-solving to provide protection; Thirdly, comfortable and spacious smart classroom environment, as well as cultural environment to create. Therefore, students are more immersed in learning, improve learning efficiency.

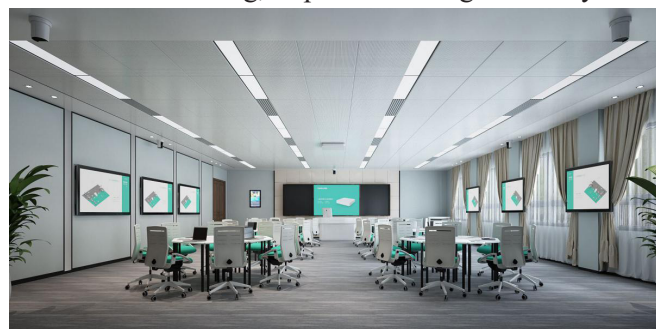


Figure 2. Multi-screen display type intelligent classroom rendering (Source: Baidu image).

5.2 Smart classroom with multi-screen display

The multi-screen display type of smart classroom is mainly composed of multiple electronic large screens, which can be displayed and shared on multiple screens. As shown in Figure 2, the multi-screen smart classroom is designed with six teams. Each team is corresponding to one electronic screen. In the process of explanation, the teacher can display the teaching content on the main screen of the blackboard, or display the six side screens live. Each group can display the results of their group on the corresponding electronic screen, or share them with other groups for mutual evaluation.

The multi-screen smart classroom is very helpful for teaching marketing, advertising and other professional courses.

The main functions of the multi-screen smart

classroom are: Firstly, teachers can share the teaching content in the teaching process, as well as access students' learning content for quick review and real-time teaching progress. Secondly, students can learn to show, can also be shared with other electronic screen, communication and interaction, common learning. Thirdly, it can drive students' enthusiasm for learning and their ability to express themselves, and cultivate students' positive and self-expressive qualities.

5.3 Discussion-based Smart Classroom



Figure 3. Image of a discussion-based smart classroom (Source: Baidu image).

The group discussion teaching method is a teaching method in which the teacher, based on the analysis of teaching objectives, carefully designs a problem, discusses it in small groups, and instructs students to express their own opinions in the discussion to find the answer to the problem. Therefore, students' abilities can be enhanced via developing students' thinking and creative abilities besides cultivating their scientific spirit and independent personality[12-13].

As shown in Figure 3, the construction of a smart classroom based on the group discussion teaching method is mainly based on an open environment with the elimination of fixed tables and chairs and replacing with portable chairs. After the teacher assigning the task, the students are freely grouped for discussion.

For most of the professional courses in the College of Finance and Economics, the discussion-based smart classroom can also be used for teaching.

The main functions of a discussion-based intelligent classroom are: Firstly, the teacher can play an important guiding role in the process of students' group discussions, and cultivate students' teamwork and problem-solving skills; Secondly, students can give full play to their creative thinking and innovative consciousness during the discussion process, and improve their coordination and communication skills with team members; Thirdly, the open and free

classroom environment can influence students' creative thinking more subconsciously, and cultivate students' innovative abilities.

6 Application of instructional smart classrooms

The practical application of smart classroom is favoured by teachers and students. The teacher completely switches from lecturer to guide, conducting the student-centred, driving students' enthusiasm and initiative. This will not only improved the learning efficiency but also fully enhanced the students' expression ability. The author takes the practical application of the group discussion-type smart classroom as an example to show the application of the teaching-type smart classroom.

6.1 Scanning code into the classroom and random grouping

The teacher enters the classroom and gently clicks on the nano-blackboard to enter the teacher client. Then, the teacher clicks on the client to set the QR code of the classroom. After the QR code is displayed on the blackboard, students can enter the smart classroom by scanning the code with their mobile phones, and also complete the check-in of students.

When students enter the classroom, the teacher can group them randomly in the client, which is fast and convenient. According to the grouping situation, students can find their group members by gently moving the smart combination table and chair. The teacher's mobile podium (Figure 4) can also be used for close interaction with students at any time.



Figure 4. Mobile podium.



Figure 5. Brainstorming Results Presentation

6.2 In-class tests are quickly initiated to consolidate knowledge points in time

Before the lesson, students can have a brainstorming session to get into the learning state quickly, as shown in Figure 5.

As the class progresses, the teacher can quickly initiate in-class tests, such as single-choice questions, multiple-choice questions, judgment questions, voting, etc., to consolidate the knowledge points in time. Not only the operation is simple and straightforward, but it also improves classroom efficiency. Students' answers can be presented on the big screen simultaneously, and statistical analysis can be performed in the form of graphs and charts, which is intuitive and clear, as shown in Figure 6.



Figure 6. Simultaneous presentation of statistics.

6.3 Group report and discussion result presentation

After the discussion in groups, students collide with each other's ideas according to their groups and present the results of the discussion. Students from other groups have questions and can make additional comments in class, and the teacher can answer them in time. At the end of the class, students can collect the lesson content and review and consolidate their knowledge after class.

6.4 The teacher can view data and reflect on teaching after class

After the lesson is over, the teacher client can automatically generate the class report for the lesson. After the lesson, the teacher can check the background data (Table 4) in his office or at home, through a computer or mobile phone, to understand the students' knowledge. The teacher client can also analyze the data of the lesson and display it clearly to the teacher (Figure 8) so that the teacher can reflect on the lesson in time.

Table 7. Example of statistical analysis of mobile phone data

Subjective question	Correction rate	Response rate	Average score
1	61.5%	100%	8.3
objective question	accuracy rate	response rate	average score
1 single-choice question	66.7%	100%	0.7
2 voting question	100%	100%	1
3 multiple-choice question	88.9%	100%	0.9

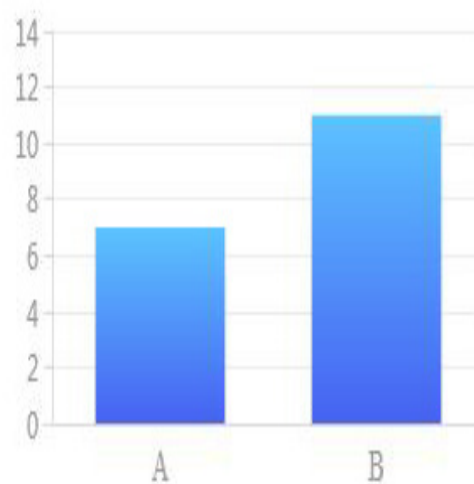


Figure 7. Statistical analysis of mobile phone data. Number of completions (18/18) (100 per cent) correct (67 per cent); Number of voters: 18 (Green is correct, red is wrong)

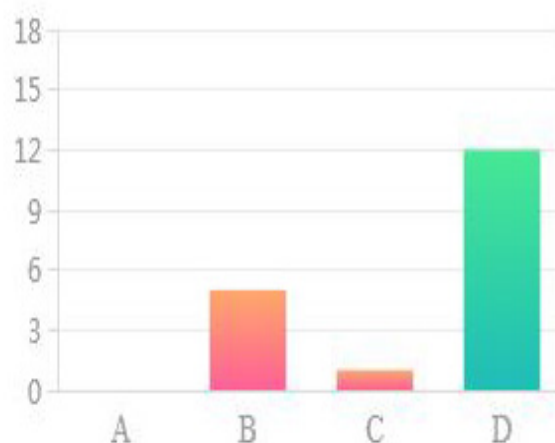


Figure 8. Statistical analysis of computer-based data (Above: single-choice questions, Below: polling questions).

7 Future developments and prospects

Combined with the professional setting and development of Guangxi University of Finance and Economics, and the construction and put into use

of smart classrooms, the school will have several distinctive teaching to stand out. The teaching features based on the smart classroom will break the tradition of the ordinary multimedia classroom, will continue to show the advantages of blended learning and fully drive students' enthusiasm and innovation. Combined with online and offline teaching layout, the flipped classroom will improve students' learning efficiency and their ability to actively search solutions to problems.

The construction and application of the smart classroom will help in improving the teaching environment of Guangxi University of Finance and Economics and is of great significance for improving the level of informatization of teachers, exploring the deep integration of information technology and teaching, transforming teaching mode, promoting teaching reform and modernizing teaching.

In the future, with the in-depth application of the smart classroom, we will carry out in-depth research and exploration in the advantages of combining curriculum and intelligent classroom, the effectiveness of flipped classroom teaching to improve students' hands-on ability and innovation, and the cultivation of teachers' and students' media literacy in the new media era.

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