



Design and application of micro-class based on the course of Sensor and Detection Technology

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Abstract. With the rapid development of information technology, micro courses have broad educational application prospects. This article integrates lively teaching materials and knowledge points into the textbook resource package through the micro course design of "Sensor and Detection Technology", improving students' ability to explain and summarize teacher knowledge, developing teachers' perspectives, enhancing their self-criticism ability, and promoting their mastery of modern information technology. The foundation of teaching and learning is to achieve refinement, real-time evaluation and diagnosis of classroom teaching quality.

Keywords: Sensor and Detection Technology, micro-lesson, educational application prospects, teaching influence.

1 Introduction

1.1 Research Background

Education is the foundation of our country. With the development of information technology, micro-lecture has gradually become the focus in the field of education and aroused extensive attention from educators. It will become a new kind of teaching mode and an approach to learning. Mobile learning, distance learning and online learning which based on the micro-lecture will be more and more popular in education^[1].

In the process of information development, sensors have gradually become the forefront technology of information system development, and increasingly enter our life. The development of the course "Sensor and Detection Technology" is a course based on intelligent information technology. In the teaching process of the course "Sensor and Detection Technology" in higher vocational colleges, the combination of theory and practice is emphasized, the development of integrated courses is emphasized, and systematic teaching practice is carried out^[2].

1.2 Research Issues and Objectives

The sensor abstraction in textbooks is difficult, which makes students lose interest in learning networks. In order to change this phenomenon, a micro-lesson is designed to analyze the weak points of the knowledge points of the learning sensor, and relevant micro-lessons and exercises of different difficulties are designed to help students understand and consolidate the definition, development history, function, application, characteristics and other knowledge points of the subject, so as to continuously improve students' ability to master knowledge. Lead the students into the world of sensors, and develop a strong interest in the subject of information systems based on the Internet of Things.

2 Literature Review

2.1 Current Research Status at Home and Abroad

Domestic research status:

Research process:

Relevant research on micro-courses in China began in 2011. In 2012 and 2013, micro-courses gradually became the focus of scholars' attention.

The earliest article related to micro-courses was "Micro-Course" by Guan Zhongke in 2011. The article elaborated on the origin of the concept of "micro-course" at home and abroad and pointed out that micro-courses cannot be applicable to all courses. Which courses or teaching contents are applicable need to be tested through practice.

Research content:

At present, micro-course research in China mainly focuses on micro-course design principles and methods, micro-course teaching resource development and management, micro-course evaluation and feedback, and other aspects.

Design and development of micro-courses: It includes links such as front-end analysis, micro-course elements and design, evaluation and feedback. At the same time, some scholars have also proposed two main forms of micro-course development: one is to process and transform existing excellent complete lesson examples or video lesson examples; the other is original development, that is, designing and developing a brand new micro-course.

Teaching application of micro-courses: Micro-courses are widely used in the field of education, meeting the individualized learning needs of students and bringing development opportunities for teachers' professional growth. At the same time, micro-courses are also applied in multiple fields such as enterprise training and job skill training.

Research hotspots and trends:

Personalized teaching: With the transformation of educational concepts, personalized teaching will become an important direction for the future development of micro-courses.

Transformation of teachers' roles: In the implementation process of micro-courses, teachers' roles will change from traditional "imparters" to learning guides and organizers of learning communities.

Innovation of technical means: In the future implementation of micro-courses, more technical means such as virtual reality and augmented reality will be used to provide a more rich and intuitive learning experience.

Foreign research status:

Origin and development:

Microlecture was proposed in 2008 by David Penrose, a senior instructional designer at San Juan College in New Mexico, USA.

He believes that this short knowledge pulse, supported by corresponding assignments and discussions, can achieve the same effect as traditional long lectures, and proposed five steps to build micro-courses.

Research content and characteristics:

Foreign research on micro-courses is also paying more and more attention, but the uniformity of its core resources, the tightness of the course structure, and the self-growth ability of resources still need to be improved.

Micro-courses have received extensive attention in foreign enterprise training and personal learning and other fields. Scholars have discussed aspects such as the design, production, and application of micro-courses, forming a series of micro-course teaching theories and practical cases.

Development trend:

Similar to domestic ones, the development of foreign micro-courses also shows characteristics such as personalization, intelligence, and cross-disciplinary integration.

The customization of personalized learning resources and the application of intelligent teaching assistant systems will become an important direction for the future development of micro-courses.

3 The Meaning and Characteristics of Micro Class

According to Hu Tiesheng, China's famous micro-course practice researchers say in the sense of micro-course, "This is a" micro-course "with teaching video as the main carrier, which is an organic combination of a series of teaching resources for a certain knowledge point or teaching link in the course of classroom teaching according to the new curriculum standards and educational practice requirements. Therefore, the meaning of this point is: "micro class", and "very 5+1" is used to describe the framework of micro class curriculum. "1" in 5+1 refers to the 5-8 minute micro-class video. The core of the video is based on integrated micro-class teaching plan, and its main contents include "micro-class pieces, micro-class exercises, micro-reflections and micro-comments". "5" supporting resources, together to form the micro course. The application of different courses can be transformed based on the content of the course, and the "5" parts can be arbitrarily combined into a complete course micro-lesson, or can be used separately to meet the needs of teachers and students for personalized teaching and learning. From the overall status quo of education, classroom teaching is also the main

form of teaching, students in the classroom. After 45 minutes, he has poor concentration in the classroom, especially when he meets more abstract and difficult knowledge points, he cannot study for a long time. All the knowledge points are not mastered, also can not understand the knowledge points very thoroughly. The feedback of this phenomenon determines the importance of teachers teaching and learning according to the characteristics of students. This is where micro-lessons come in. Teachers can use micro-lessons as teaching carriers in the classroom. This includes short videos and accompanying resources. Different classroom topics arouse students' interest in learning. To better focus on the classroom, students can also preview and review in class through micro-lessons. Explain and describe the knowledge points of class content around the subject knowledge points and complete knowledge points within a limited time.

4 The Influence and Development of Micro Class on Classroom Teaching

As shown in Figure 1.

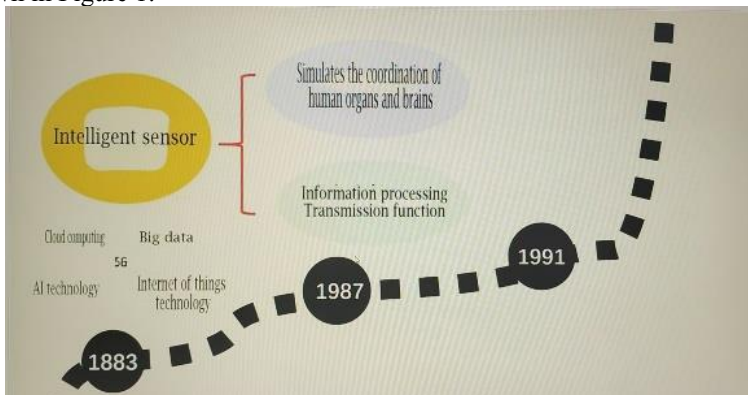


Fig. 1. Development history of sensors

4.1 The Application of Micro Class and Flipped Classroom

By combining flipped classroom with micro-class mode, the comprehensiveness of micro-class resource integration and the teaching power of classroom mode can enhance students' interest in knowledge, and establish an online education platform to spread knowledge of major selection level based on textbooks. Students pay much attention to the combination of flip class and micro class. Through the flip class teaching platform, their teaching materials are constantly read and learned by students after class. With this new teaching method, students' enthusiasm and desire for knowledge are aroused. At the same time, tedious and boring teaching is eliminated in the classroom, creating a good learning atmosphere for students and a good education ecology for teachers^[3].

4.2 The Transformation of Teaching and Learning Patterns Triggered by Micro-Lessons

Teachers have carried out teaching activities in the traditional information technology classroom. Although they insist on the teaching concept of student-oriented, learning first and teaching later, they often fail to advance the learning progress according to the normal order in order to truly achieve learning first and teaching later, and students have few self-learning abilities and ways. Self-study time is limited, so teachers need to help students digest and absorb knowledge points to realize the reform of classroom teaching. Students can first learn video courseware and course cases and watch them repeatedly. Micro-lessons can be discussed and designed according to students' learning situation, which can overcome the difficulty of "one teacher with more students". When students encounter difficulties or doubts, teachers can simply use electronic devices as appropriate tips and reminders, and truly return to the dominant position of students^[5].

4.3 Break the Time, Region and Level Restrictions of Micro Class

The teaching and learning of knowledge points are carried out through different electronic devices. Micro-courses explain one knowledge point within the time, saving the learning time and improving the efficiency and learnability or repairability of students. For those who are slow to learn and have little knowledge, they can also review and consolidate the micro-lessons that they watch again and again after class. Students can learn deeply according to their own actual situation, which makes it easier for teachers to understand the level of students. Similarly, electronic devices can also be used to discuss or inquire after class or at home if you don't understand important and difficult points. In the future, education after micro-class is no longer limited to the classroom and school, and learning can be done all the time from class to extracurricular.

4.4 Micro Class will Change the Traditional Education Mode

With the development of micro courses in the education industry, relevant software websites have been developed and built together. It will also change the traditional way of teaching from books. Then truly realize the network resources in the classroom sharing, enriched the teaching content, and use a variety of important and difficult points to explain and breakthrough methods. The knowledge extension will also be very extensive. Even if the students are interested and fun, they can choose their favorite content from the micro-course website according to their own preferences for self-study, so as to better realize what they have learned. Teachers can also change traditional IT assessment models in the classroom. Students can be assessed using various forms of micro-lesson devices^[6].

As an educational resource, micro lesson is a new way of learning. It provides us with a platform "micro age". However, it should be noted that in the actual research process, not all teaching contents are suitable for micro class, and "flipped classroom" and "micro class" cannot be expected to solve the defects in all classroom teaching modes, but they have a positive impact on classroom teaching. For educators, it is of

great significance to think about how to motivate students' knowledge autonomy and enthusiasm, explore the application of micro-lessons in teaching, and make the classroom become a paradise of learning, giving lessons to the classroom, and making their own personalities soar.

5 The Problems Existing in the Introduction of Micro-Class Teaching in Classroom

5.1 The Introduction of Blunt

A good introduction to the class will cause students to pay attention to the class. However, "for the sake of guidance" and introduction of rough lessons may also lead to disinterest in classroom learning and influence. The main problem in the design of micro courses is due to deviations in teachers' understanding of "micro courses". As a new student, some teachers are only aware of the characteristics of "micro, small, simple, and short", but of course, micro does not truly provide students with systematic knowledge. For freshmen who have just come into contact with the knowledge of the Internet of Things, when the teacher explains the course Sensor and Detection Technology, the knowledge about sensors is abstract and difficult, which makes students lose their interest in learning the Internet of things. If the class is introduced directly in the form of questioning, and the questions asked have little relationship with the knowledge points of the course to be told, If the questions asked are linked with the knowledge points of the elder sister's course, people will feel that it is very far-fetched and cannot attract students to have a strong interest in the information system of the Internet of Things. If the course generates interest in learning, it will be reversed. As shown in Figure 2.

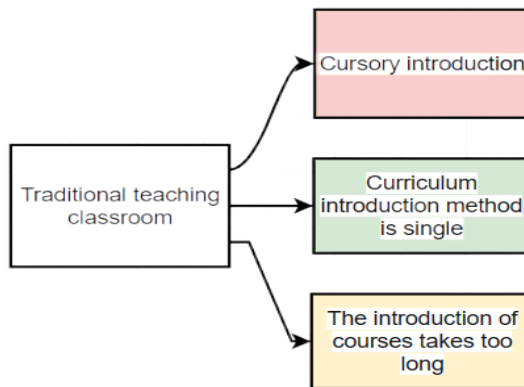


Fig. 2. Classroom introduction in traditional classroom

5.2 Single Method

When microteaching is introduced into the classroom, the classroom learning methods are relatively simple, and often adopt the traditional teaching methods to introduce. Only a few teachers are able to combine multiple lead-in methods. In particular, the practical computer courses have adopted modern teaching methods. Moreover, when applying micro courses, teachers use the traditional "I tell you listen" teaching method, which does not reflect the "interactive" effect of micro courses. Without diagnosing students' learning situation, teacher-student communication is often empty.

5.3 Improper Time

The phenomenon of too short or too long input in micro class has a certain degree of influence on the whole classroom teaching. In practical applications, some teachers often merge a 40 minute classroom into a 10 minute micro lesson, emphasizing too much on designing micro lessons from the perspective of information technology, while neglecting the "tool" function of micro lessons, resulting in unsatisfactory teaching; Other teachers are too detailed in each section, resulting in uneven time distribution.

6 Introduction Method and Application of Micro Lesson into Classroom

A course is introduced, which is an important part and component of micro class. It has the function of reviewing old knowledge, activating Jing Yan, creating situation and stimulating motivation. Emotional regulation, interest; Help students get into the best state of study in the shortest time. There are many ways to introduce micro class. The following is to understand and explore the problems of several methods.

6.1 The Method of Inquiring into Questions

The method of introducing doubts, also known as "learning from thinking, thinking from doubt", is a conscious approach by teachers to raise "trap questions", and students unknowingly fall into the "trap" when answering questions, which leads to their conflicting answers, forcing them to actively think and then introduce the content of the new curriculum.

In the question micro class, like an invisible traction line, scattered small knowledge.

For example, what are the sensors asked in the micro-lesson "Sensor and Detection Technology"? Therefore, it arouses students' thinking and attention. Then, in the use of questions into micro-class video, attention should be paid to the reasonable design of questions in three stages: micro-class (beginning), main body (middle) and receiving (end), so that the whole micro-class will take questions as the main line, staggered forward, echo from beginning to end, and work together in one go.

6.2 News Introduction Law

Timely news. Linking interesting stories and seemingly unrelated stories from the news gradually leads to the derivation of classroom knowledge points, allowing students to participate in groundbreaking classrooms, enabling them to consistently play a "subject" role, thereby stimulating their interest in learning. This plays an important role in cultivating their political insights and other aspects.

For example, in the micro-course Sensor and Detection Technology, cool images of artificial intelligence, big data and robots are displayed to arouse students' interest, thus leading to the core of the Internet of Things system -- sensor. Then, the definition and principle of sensor are introduced through the common sensors in life. To arouse students' reflection.

6.3 Typical Case Introduction Method

The typical case introduction method(As shown in Figure 3) is one of the widely used teaching methods today. The introduction of micro courses focuses on learning through typical cases, and has advantages such as authenticity, liveliness, inspiring wisdom, training ability, drawing inferences from one example, and analogy.

The case analysis of smart mattress in the micro-lesson "Sensor and Detection Technology" helps students to further understand the meaning of sensors by analyzing the working principle of smart mattress. Thus slowly derived sensor development history, sensor function, sensor application.

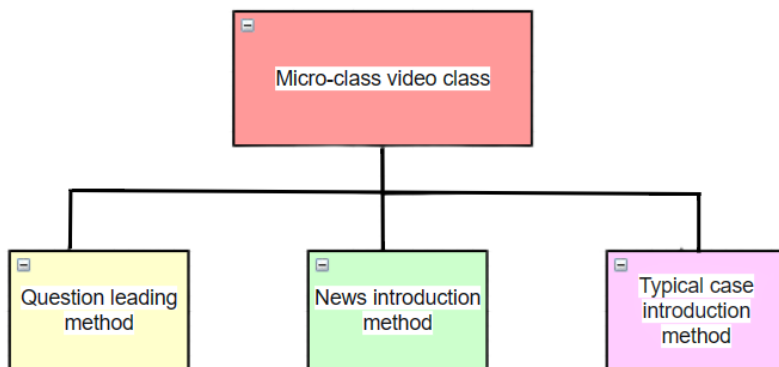


Fig. 3. Video class of micro-class

7 The Application and Explanation of Micro Class Information Case

Taking information technology courses as an example, we will analyze the influence of information technology micro-course cases in the classroom from the following aspects.

7.1 Students

The learning situation of most students: low interest, poor concentration or stability, low resistance to interference and less course rate. The single, dull and high quality classroom teaching form puts forward higher requirements for students' active construction. In order to stimulate students, a variety of teaching methods are used.

To stimulate students' attention to knowledge, help them to understand and deepen their knowledge, and enhance their ability of independent learning and comprehensive utilization.

Students acquire knowledge from passive to active.

The flexibility and autonomy of micro-class learning solves the problem of the difference of students' learning ability.

Micro lessons help students transfer and integrate skills and knowledge.

7.2 Teachers

The role of teachers has changed from explaining the basic knowledge and operational skills of information technology to helping students learn how to actively construct knowledge and assume learning responsibilities.

The content of information technology courses is varied and updated quickly. Micro-courses can provide teaching resources and practical guiding ideology to help teachers save time and improve teaching quality.

Micro-class can become a learning and communication base for teachers to establish like-minded network communities and share each other's experiments.

7.3 Teaching Content

The characteristics of informatization of technical skill courses are as follows: operability, practicality and interest. Micro-courses can visualize and detail skills, knowledge and operation process, and are characterized and integrated by single skill courses^[4].

For example, in the core course of Internet of Things engineering Technology major of applied vocational college, Sensor and Detection Technology, Chapter 1 Sensor and Detection Technology Foundation 1.1 Basic Knowledge points of sensors.

With the development of information technology, especially the sensor technology is becoming the forefront of the development of information system, and increasingly into our life. However, the abstract and difficult knowledge about sensors in the textbook makes students lose their interest in learning the Internet of Things. However, this micro-course focuses on the definition, development history, function, application and characteristics of sensors, leading students to enter the world of sensors and developing strong interest in learning the information system based on the Internet of Things.

7.4 Teaching Methods

Questions and answers and interactive answers are one of the classic teaching methods. Answers are often formalized and mechanized in class, and natural responses are not

uncommon. The interaction between students takes place in class, and the results are generally better due to the state of mind and cognitive level. There are fewer opportunities to use the classroom to help teachers help students; In the use of teachers' micro-class teaching, the application of interactive and strategic incentive design improves the number of students' asking for help after class.

7.5 Evaluation after Class

The degree of mastery of students at different learning levels may vary, and the pace may vary, but it is possible to learn, deepen and consolidate certain parts of knowledge by micro-class. This can not only overcome the difficulty of teaching effect of teachers of different students in the integration and differences, but also help to improve the learning quality of students and improve organizational education.

8 Methodology

8.1 Research Methods

This study adopts a combination of various research methods to comprehensively and deeply explore the application of micro-courses in the "Sensors and Detection Technology" course.

Literature Review Method

By consulting relevant domestic and foreign literature, we understand the development history, definition, characteristics, educational application prospects of micro-courses, as well as their application modes and effects in other disciplines. Comprehensive analysis and sorting of existing literature provide a theoretical basis and research ideas for subsequent research. During the literature review process, special attention is paid to literature related to sensor technology education and research achievements in the field of educational technology on micro-lesson design and application.

Case Analysis Method

Taking the application of micro-courses in the "Sensors and Detection Technology" course as a case, we deeply analyze the specific implementation process, application methods, existing problems, and solution strategies of micro-courses in the teaching of this course. Multiple representative micro-course teaching cases are selected, including different teaching contents, teaching objectives, and teaching objects. Through detailed analysis of these cases, we summarize the successful experiences and shortcomings of micro-courses in sensor course teaching, providing a reference for further optimizing micro-course teaching.

Questionnaire Survey Method

Questionnaires are designed and distributed to students and teachers to understand their perspectives, usage experiences, effect evaluations, and improvement suggestions on the application of micro-courses in the "Sensors and Detection Technology" course. The questionnaire content covers aspects such as students' learning interests, learning effects, and the cultivation of autonomous learning abilities, as well as teachers' improvements in teaching methods, utilization of teaching resources, and enhancement of

teaching effects. Through statistical analysis of questionnaire data, objective and accurate data information is obtained to provide data support for drawing research conclusions.

8.2 Data Collection

Literature Data Collection

Relevant literature on micro-courses and sensor technology education is collected through academic databases (such as CNKI and Web of Science), educational websites, related academic journals, and books. Keyword searches (e.g., "micro-courses," "micro-lessons," "sensors and detection technology," "educational application") are conducted to filter out literature that aligns with the research theme. The selected literature is then downloaded, organized, and analyzed.

Case Data Collection

Micro-course Resource Collection: Micro-lesson videos, instructional design plans, teaching slides, exercise questions, and other related teaching resources used in the "Sensors and Detection Technology" course are collected. These resources primarily originate from course instructors, the school's teaching resource library, and online education platforms. **Teaching Process Documentation:** The practical application of micro-courses in classroom teaching is observed and recorded, including teachers' instructional activities, students' learning performance, and classroom interaction. Detailed teaching process data is obtained through lesson observation notes and classroom recordings. **Student Learning Outcomes Collection:** Students' assignments, exam scores, project reports, and other learning outcomes after micro-course learning are collected to assess their learning effectiveness. Additionally, feedback and suggestions from students during the learning process are gathered to understand their satisfaction with micro-course teaching and their improvement needs.

Questionnaire Survey Data Collection

Questionnaire Design: Based on the research objectives and content, separate questionnaires are designed for students and teachers. The questionnaires cover personal basic information, cognition and attitudes towards micro-courses, usage scenarios of micro-courses, evaluations of learning effectiveness, existing problems, and suggestions. The questionnaires employ a combination of multiple-choice and open-ended questions to obtain comprehensive and accurate information.

Questionnaire Distribution and Collection: The questionnaires are distributed to students and teachers through online questionnaire platforms (e.g., Wenjuanxing). Before distributing the questionnaires, respondents are informed of the survey's purpose, significance, and completion requirements to ensure the validity and response rate of the questionnaires.

8.3 Data Analysis

Literature Data Analysis

Content analysis is conducted on the collected literature to extract key information related to micro-courses and their effectiveness, including definitions, characteristics,

application modes, and effectiveness evaluations of micro-courses. Bibliometric methods are employed to statistically analyze the publication years, authors, research institutions, and keywords of the relevant literature, providing insights into the research hotspots and development trends in this field. Through comprehensive analysis and comparison of the research perspectives and conclusions from different literature, theoretical support and research ideas are borrowed for this study.

Case Data Analysis

Qualitative Analysis: In-depth qualitative analysis is conducted on the collected micro-course teaching cases, using methods such as case description and case comparison, to summarize the successful experiences and existing problems of micro-courses in the teaching of "Sensors and Detection Technology". The characteristics and advantages of micro-courses in terms of instructional design, teaching methods, and teaching resource utilization, as well as the difficulties and challenges encountered in actual teaching processes, are analyzed. Through detailed case analysis, targeted improvement suggestions and strategies are proposed. **Quantitative Analysis:** Statistical analysis is performed on students' learning outcome data (e.g., exam scores, homework grades) to calculate statistical indicators such as average scores, standard deviations, and pass rates, assessing the impact of micro-course teaching on students' learning effectiveness. Additionally, quantitative data obtained from questionnaires and interviews, such as students' and teachers' satisfaction ratings for micro-course teaching and the frequency of micro-course use, are statistically analyzed using descriptive statistical methods to visually present data distributions and characteristics.

Questionnaire Survey Data Analysis

Descriptive Statistical Analysis: Descriptive statistical analysis is conducted on the basic information of students and teachers, as well as the use of micro-courses, obtained from the questionnaire survey. Frequencies, percentages, means, and other indicators are calculated to understand the basic situation of respondents and the current application status of micro-courses in the teaching of "Sensors and Detection Technology".

Correlation Analysis: The correlation between students' learning effectiveness (e.g., exam scores, improvement in autonomous learning ability) and their use of micro-courses (e.g., frequency of use, study time, learning methods) is analyzed to explore the factors influencing students' learning effectiveness through micro-courses. Statistical methods such as the Pearson correlation coefficient are used to determine the degree and direction of correlation between variables.

9 Conclusions

"Micro lesson" it uses traditional teaching methods. Effectively help him to support teaching in the classroom, can focus on solving the traditional teaching method cumbersome or can not show the content of the textbook, but also can use the interactive network learning platform to support students to learn independently. It can help develop students' initiative to learn, identify and raise these difficulties, and improve their ability to collaborate. It provides a chance for college students to develop well beyond

the boring code and practical courses. This provides an opportunity for the healthy development of college students involved in boring code courses and practical courses^[7].

Its profound application, will make the students' learning more liberated, teachers smart peripheral vision. There is no end to teaching and learning. Teachers must be good at digging. There are more applications of micro-class, its teaching form is in line with students' learning characteristics and development needs, and its educational essence is consistent with the theory of learning cultivation in constructivism. There are many ways to motivate students to learn. I believe that at some point in the near future, "micro-lessons" will not only be an important resource for school education, but also a positive and important factor in teacher and student learning growth^[8].

Acknowledgments

After more than two months of hard work, I finally finished the paper. From getting the title of the paper, to the implementation of the system, to the completion of the chapter of the paper, every step is a new attempt and challenge for me, which is also the biggest project I completed independently during the university. In this period of time, I learned a lot of knowledge, feel quite deep. From scratch, I began to study and experiment independently, check relevant materials and books, make the vague concepts in my mind gradually clear, and improve my very immature works step by step. Every progress is my learning harvest. The success of each experiment always excites me for a while.

My thesis works are not very mature and have many deficiencies. But the experience of this paper has been a lifelong benefit to me. I feel that the text is really to do something with your heart, is really their own learning and research process. Without learning, there can be no research potential, without their own research, there can be no breakthrough, which is not called paper. I hope this experience will motivate me to make continuous progress in my future study.

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