




Communication Technology from the Perspective of Precise Thinking for the Infrastructure Development Management of Middle School Students in the COVID-19 Environment

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Abstract. The inherent requirement of improving the orderly advancement of student management under the COVID-19 is also the main direction of management reform under the new situation. Embedding precise thinking into college student management can help improve students' future classes and life quality and enhance teaching effectiveness. To ensure that students attend classes, one of the main contents of college teaching management is the daily attendance management of students. This paper develops a student attendance management system based on RFID technology. Experiments show that our method meets the design performance requirements of the system. It plays an important role in daily student attendance management.

Keywords: management reform; quality improvement; information society; Infrastructure Development

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1 INTRODUCTION

Since 2020, the COVID-19 that has ravaged the world has disrupted the normal pace of economic and social development. Moreover, it brought considerable challenges to education and teaching activities in colleges and universities. How to ensure and improve the quality of student management has become a major theoretical and practical issue focused on by the educational and academic circles. The author does not stop at being superficial and joins this field of discussion to discuss the improvement of the quality of college student management based on precise thinking [25]. Embedding precise thinking into all aspects of the whole process of student management in colleges and universities will help to improve the quality of online teaching and enhance the effectiveness of student management. In view of the importance of precise thinking, this paper intends to analyze the specific application of precise thinking in college student management from the dimensions of lesson preparation, teaching, supervision, and other teaching processes, to provide a useful reference for the stable, orderly and high-quality operation of college student management.[17] Infrastructure development, in the context of this paragraph, refers to the technological and

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organizational support needed to facilitate the application of precise thinking in student management. It involves creating efficient systems and processes that enable precise thinking to be embedded in lesson preparation, teaching, supervision, and other aspects of student management. By investing in infrastructure development, colleges and universities can effectively support the implementation of precise thinking and improve the overall quality of student management.

At present, RFID technology is in the development period at home and abroad, as shown in Table 1, it has obvious advantages over barcode and IC card RFID. Therefore, it has involved all aspects of people's daily life, and will become a basic technology for the construction of the future information society, such as ID cards and passports. my country's smart ID cards are called the world's largest RFID technology project, with a total demand of 900 million pieces, the total value of ID cards is 2.25 billion US dollars, and the consumption of card readers is 1.2 billion US dollars. This is the largest single application of RFID technology market in my country in recent years. In recent years, the application of RFID technology has also shown rapid development. The handheld reader has great flexibility and is suitable for application environments where it is not suitable to install a fixed RFID system. Of course, it can also be used as a fixed reading and writing device [10]. The handheld reader is mainly carried by the operator to complete the collection of data information related to electronic tags in non-fixed areas or distribution areas. It can not only transmit the data to the computer in real time while reading the data, but also temporarily save the data in the local memory, and then transmit it after all the data is collected. Considering the large application requirements of handheld readers, it is of great significance to design a handheld terminal with excellent performance.

| <i>parameter</i> | <i>Typical data volume/byte</i> | <i>Data density</i> | <i>Affected by pollution/humidity</i> | <i>Affected by light cover</i> | <i>Worn/worn</i> | <i>cost</i> | <i>Unauthorized copy/modification</i> | <i>Reading speed</i> | <i>Maximum reading distance</i> |
|------------------|---------------------------------|---------------------|---------------------------------------|--------------------------------|--------------------|--------------------|---------------------------------------|----------------------|----------------------------------|
| <i>barcode</i> | <i>1~101</i> | <i>Small</i> | <i>Very serious</i> | <i>Very serious</i> | <i>Conditional</i> | <i>very seldom</i> | <i>easily</i> | <i>Low ~4s</i> | <i>50cm</i> |
| <i>IC card</i> | <i>16~65K</i> | <i>Very high</i> | <i>Possible</i> | <i>—</i> | <i>Contact</i> | <i>very seldom</i> | <i>easily</i> | <i>Low ~4s</i> | <i>direct contact</i> |
| <i>RFID</i> | <i>16~65K</i> | <i>Very high</i> | <i>No impact</i> | <i>No impact</i> | <i>No impact</i> | <i>commonly</i> | <i>impossible</i> | <i>Low ~4s</i> | <i>200m existing application</i> |

Table 1: Comparison of advantages and disadvantages of main identification systems.

2 RELATED WORK

2.1 Teacher Requirements Under Precision Teaching

Teachers are the key to the orderly advancement of course teaching, and their professional qualities determine the quality and level of teaching [16]. To meet the needs of student management, teachers should start from the following two aspects. On the one hand, the concept should be changed. Student management is not a new thing, it comes with the advancement of teaching

technology, and modern distance teaching is the best case [8]. However, the nationwide large-scale online teaching has happened since the outbreak of the COVID-19 pneumonia this year. This does not put much pressure on teachers who are familiar with student management. However, for those teachers who focus on traditional offline teaching, it is undoubtedly a Serious challenge [19]. If teachers lack a basic understanding of student management, the pertinence and effectiveness of student management will inevitably be weakened. To this end, teachers should actively change their concepts, face up to the potential and advantages of student management, and take student management as the main direction of teaching reform in the future [7]. On the other hand, the ability to improve. At the same time, it is necessary to control the classroom discipline and students' learning status during online live teaching [23]. Therefore, colleges and universities must prepare teachers carefully before promoting student management, secure the access threshold of student management teachers, and expand and strengthen the team of student management teachers [4].

2.2 Application and Development of RFID Identification System

After more than half a century of development, it has become more and more mature and diversified from military to civilian use. In foreign countries, RFID technology has been widely used. For example, the US government has applied RFID technology to national defense management, and many companies represented by retail giant Wal-Mart have also widely used RFID technology in the field of logistics. The application of production control, public transportation, medical management, public safety, and other fields is also actively carried out; Europe is currently very mature in the application of RFID technology in the fields of retail, public transportation, and postal services; Japan has also won the application of RFID technology. Great success, electronic tickets, transportation cards, public services, etc. are widely used; South Korea successfully applied RFID technology in postal sorting, greatly improving efficiency and reducing costs. In China, automatic identification of railway locomotives and identification of second-generation ID cards are among the most successful application cases. In addition, there are corresponding applications in the fields of identification, anti-counterfeiting, commercial supply chain, public transportation management, etc. In addition, contactless IC cards are used in highway tolls, parking lot tolls, gas station tolls, smart card gas meters, water meters, and electricity meters. Especially during the 2008 Beijing Olympic Games, RFID technology has been widely used. Compared with developed countries in Europe and the United States, the application of RFID technology in my country is still in its infancy. Many key core technologies are in the hands of foreign giants, but the country is stepping up the formulation of relevant policies to support related enterprises and scientific research institutes. The increased RFID technology research and development efforts. After several years of development, my country's RFID technology research and development and application have achieved leapfrog progress. As the world's largest manufacturing center and an emerging consumer market, China's demand for RFID will also increase. The application scope of RFID is also expanding, and the application fields are also increasing. We have reason to maintain a positive and optimistic attitude towards the future development of RFID technology in China.

3 METHODOLOGY

3.1 The Overall Structure and Workflow of the Attendance System

This system adopts c/s structure and runs in intranet. The overall structure is shown in Figure 1. The student attendance management system is composed of attendance machines, servers, databases, educational affairs attendance management units, data printers, etc. in multiple classrooms. It is stored and transmitted to the attendance management office through the data bus.

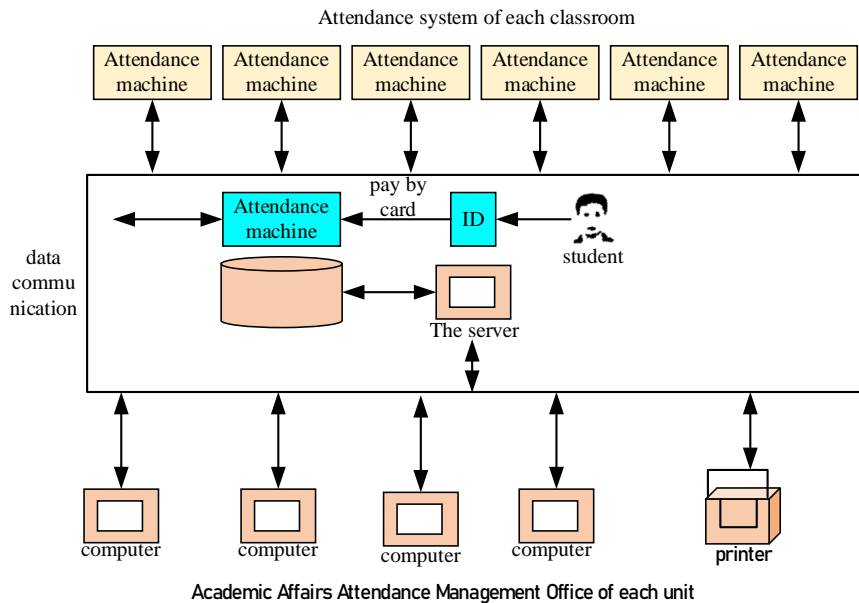


Figure 1: Overall structure of attendance system.

When a report is required, the corresponding attendance report can be obtained through query and printed out. The attendance machine completes the usual attendance record work and can receive commands from the upper computer (attendance management software) at any time and respond accordingly.

3.2 The Structure and Workflow of the Attendance Machine

The handheld terminal is responsible for the collection and display of the second-generation resident ID card information, and the host computer completes the storage, analysis, and processing of the information. The handheld terminal is specifically composed of MCU module, storage module, radio frequency receiving and processing module, touch screen module and power supply module: The main control module is the data processing and control core of the reading and writing equipment, not only to control the radio frequency processing module to complete the contactless card It is also responsible for communication with the host or application system through the communication interface and control of other external devices such as display devices; the storage module stores the information read by the main control MCU from the RF radio frequency card reader module in the SD card. The radio frequency module is responsible for the processing of radio frequency signals and data transmission, and completes the reading and writing of the radio frequency card; the touch screen module completes the information display of the menu of the handheld device and the second-generation ID card; the power supply module provides a stable power supply for the system and realizes the charging and discharging of the battery pack Management, rational and scientific management and reduce system power consumption, as shown in Figure 2.

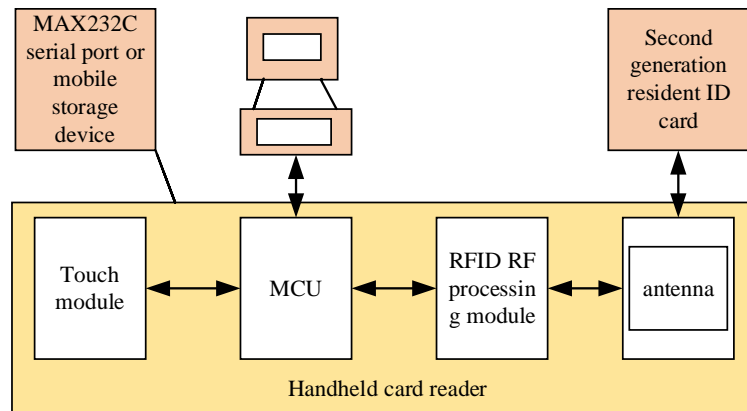


Figure 2: Hardware framework of the second-generation ID card student attendance management system.

The working process of the system: Before entering the classroom, students place their second-generation ID cards in the card reading area of the handheld card reader. Currently, the RF processing module senses that there is an IC card in the card reading area through the wire, and then obtains the ID card number of the current ID card, and then sends this number to the single-chip MCU. After the MCU receives the number, it immediately displays the LCD screen to tell the students who punched the card that the card reading was successful. At the same time, the student's punch-in record is saved in the SD card. When this class is in class, the MCU will count the normal attendance and absence of the students, and generate a data packet, which will be saved in the SD card or sent to the host computer. When the host computer receives the data packets through the serial port, it demodulates them first, and then writes them into the attendance database. System administrators can view, modify, and print attendance information through the host computer application software.

3.3 Hardware Design

The communication between the one-chip computer and the upper computer adopts the serial [2 (COM) to complete, its wiring way is shown as in Fig. 3.

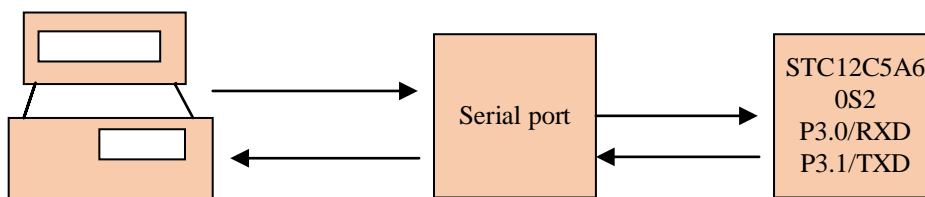


Figure 3: Schematic diagram of connection between STC12C5A60S2 and upper computer.

Serial communication using RS-232C bus requires external level conversion. The drive circuit is used to convert the TTL level to the RS-232C level at the transmitting end, and the RS-232C level is converted to the πL level by the receiving circuit at the receiving end. In this system, the level converter adopts PL2303 chip. The handheld terminal of this system is also equipped with an SD card slot, and the information read by the main control MCU from the RF radio frequency card reader

module can be stored in the SD card. SD card supports two bus modes: SD mode and SPI mode. In this system, the 4-wire SPI mode is adopted, and CS, CLK, Data in, and Data Out are used for data communication. The connection mode is shown in Figure 4.

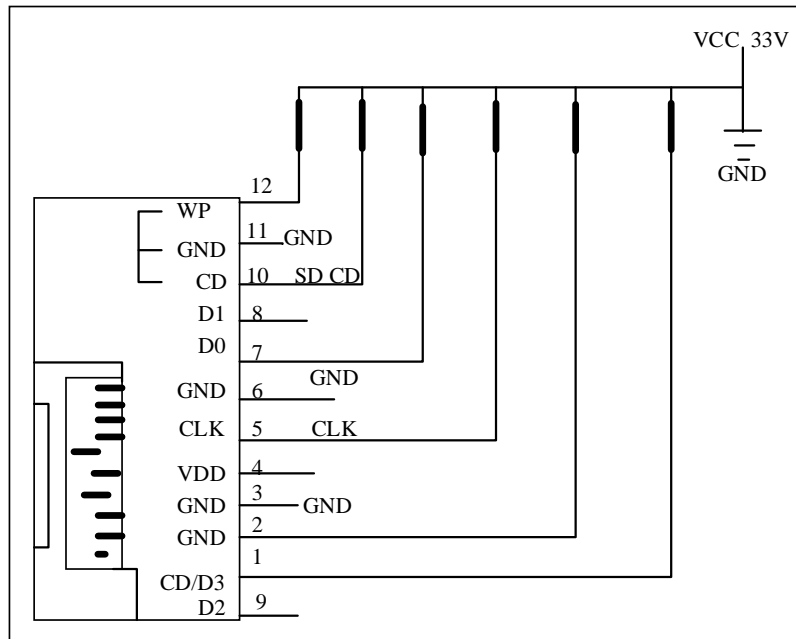


Figure 4: Schematic diagram of connection between STC12C5A60s2 and SD card

3.4 Software Design

The software design idea of the system: After the attendance software is opened, the attendance machine starts to wait for the student to dial the number. If a student starts to clock in at this time, then according to the UID read, the machine database of the attendance machine is queried. If the student's identity verification is passed, then read the current real-time time, save the current attendance record, and display the current attendance information on the touch screen. The frame diagram is shown in Figure 5.

The software design of the handheld card reader includes: RC531 driver, LCD, touch screen driver and RS232 communication program. There are 64 registers in RC531, divided into 8 pages. There are 8 registers per page, and the first register of each page is also called Page-Register. The structure of the page register is shown in Table 2 below. The seventh bit of the register is to use the page selection bit. If it is set to 1, the page selection is valid; otherwise, it is invalid. Bits 0 to 2 are page select and are only valid when bit 7 (use page select bit) is 1. Its value is the contents of register addresses A5, A4, and A3, that is, the page number of the register. When using the multiplexed address data line method, the address can be in either page mode or linear address. See Table 3. When the page mode is used, the UsePageSelect bit of the page selection register is valid, and the address composition is the page selection bit of the page selection register determines the page number, and then AD0-AD2 on the multiplexed address data line determines the number of registers in the page. After each reset of MF RC531, the default value of its page selection register is 0x80, that is, the page mode is used by default.

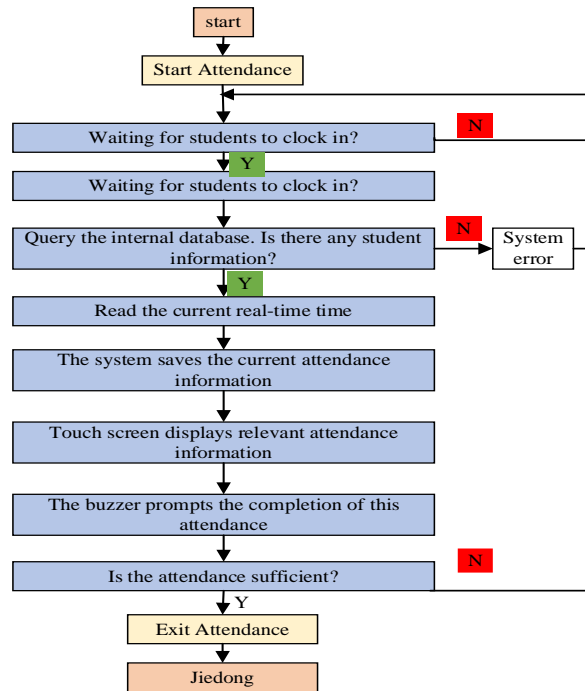


Figure 5: Software system architecture.

| | | | | | | | |
|--------------------|---|---|---|---|----------------|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Use page selection | 0 | 0 | 0 | 0 | Page Selection | | |

Table 2: Selection register structure.

| Register access mode | Whether to use page selection | Register address | | | | | |
|----------------------|-------------------------------|------------------|-----|-----|-----|-----|-----|
| | | Page Mode | 1 | PS2 | PS1 | PS0 | AD2 |
| Linear address | 0 | AD5 | AD4 | AD3 | AD2 | AD1 | AD0 |

Table 3: Register address in multiplexed address data line mode.

When using a linear address, the UsePageSelect bit of the page selection register should be set to 0 first to confirm that the page selection mode is not used. The address composition is determined by ADO-AD5 on the multiplexed address data line. Use the page mode to access the register, that is, each read/write register, first select the page where it is located according to its address, that is, write the page number to the page selection register, and then read and write the register. See Figure 6.

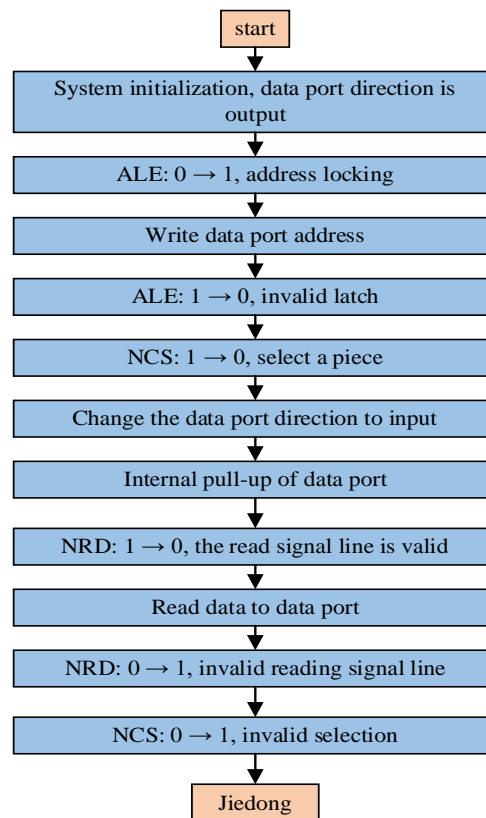


Figure 6: Program Flow Chart of Reading MFRC31 Register.

The radio frequency communication processing flow of the contactless card MF1 is shown in FIG. 7. The read-write device first sends the Request card command to the second-generation ID card within the working range of the antenna, and the card will respond to the card query command after power-on reset. After passing through the anti-collision cycle, the read-write device obtains the serial number of the second-generation ID card and selects a card according to the serial number. Then authenticate the password of the storage area of the second-generation ID card to be accessed. After password verification, the read-write device can read, write, increment, decrement, and suspend the data in the storage area.

SCON is a bit-addressable special register of MCS-51 microcontroller, which is used for the control of serial data communication. The unit address is 98H, and the bit address is 98H-9FH. The bit symbols and addresses of the registers are shown in Table 4. PCON is the power control register, PCON is not bit addressable, and the byte address is 87H. It is mainly a special register for the power control of the CHMOS type microcontroller 80C51. Its format is shown in Table 5. Only D7 bit (SMOD) is related to serial communication. This bit is the baud rate multiplication bit. When SMOD=1, the serial port baud rate is doubled. When SMOD=0, the serial port baud rate is doubled. is the set value. When the system is reset, SMOD=0. See Figure 8.

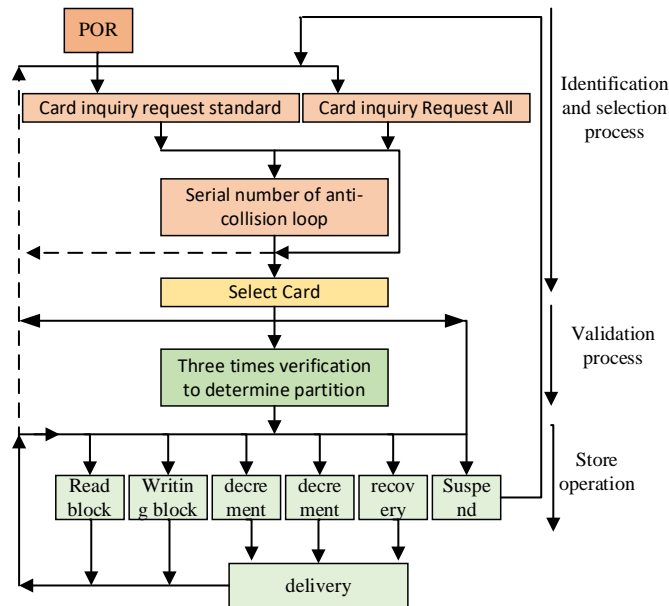


Figure 7: Communication flow of contactless card MF.

| | | | | | | | | |
|--------------------|------------|------------|------------|------------|------------|------------|-----------|-----------|
| <i>SCON</i> | <i>SMO</i> | <i>SM1</i> | <i>SM2</i> | <i>REN</i> | <i>TB8</i> | <i>RB8</i> | <i>TI</i> | <i>RI</i> |
| <i>Bit address</i> | 9FH | 9EH | 9DH | 9CH | 9BH | 9AN | 99H | 98H |

Table 4: SCON Bit Definition and Bit Address.

| | | | | | | | | |
|--------------------|-------------|-----|-----|-----|------------|------------|-----------|------------|
| <i>SCON</i> | <i>SMOD</i> | - | - | - | <i>GF1</i> | <i>GF0</i> | <i>PD</i> | <i>IDL</i> |
| <i>Bit address</i> | 9FH | 9EH | 9DH | 9CH | 9BH | 9AN | 99H | 98H |

Table 5: PCON Bit Definition and Bit Address.

4 EXPERIMENTS

4.1 RF Module Test

The radio frequency module adopts an independent control module, that is, an independent MCU is used to control the radio frequency card reader chip, and the main control MCU exchanges information with the MCU of the radio frequency module through USART2 (string 1=12). The data format of serial communication is shown in Table 6. For the test of the module, the PC serial port debugging assistant is used to connect the serial port of the PC with the RF module. Use the serial port debugging assistant to simulate the main control MCU and send a series of card reading commands to the RF module. The command format is shown in Table 7. There are four main steps to operate the RF module: ① Start the card reader; ② Set the b card connection; ③ Open the card reader antenna; ④ Find the card.

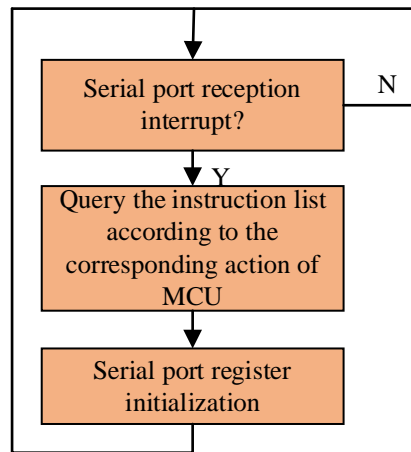


Figure 8: Flow Chart of Serial Port Interrupt Processing Program.

| | |
|------------------|-----------------|
| <i>Baud rate</i> | <i>19200bps</i> |
| <i>Check bit</i> | <i>None</i> |
| <i>Data bits</i> | <i>8-bit</i> |
| <i>Stop bit</i> | <i>1-bit</i> |

Table 6: Serial Communication Data Format.

| <i>Frame header</i> | <i>Data length</i> | <i>spare</i> | <i>Instruction word</i> | <i>command</i> | <i>check</i> |
|---------------------|--------------------|------------------|-------------------------|------------------|------------------|
| <i>(2 bytes)</i> | <i>(2 bytes)</i> | <i>(2 bytes)</i> | <i>(2 bytes)</i> | <i>(1 bytes)</i> | <i>(1 bytes)</i> |

Table 7: Format of RF Module Control Command.

When the above four steps are performed, the serial port of the RF module will return the corresponding reply command. Indicates whether each step is often completed under J. Among them, the most important UID serial number is obtained in the reply command in the fourth step. The specific operation instructions are shown in Table 8.

| <i>Step 1: Start the card reader</i> | |
|---|--------------------------------------|
| <i>Host ->RF module</i> | <i>AA BB 06 00 00 00 0C 01 00 0D</i> |
| <i>RF module ->host</i> | <i>AA BB 06 00 00 00 0C 01 00 0D</i> |
| <i>Step 2: Set the b card connection</i> | |
| <i>Host ->RF module</i> | <i>AA BB 06 00 00 00 08 01 42 4B</i> |
| <i>RF module ->host</i> | <i>AA BB 06 00 00 00 08 01 00 09</i> |
| <i>Step 3: Turn on the reader antenna</i> | |
| <i>Host ->RF module</i> | <i>AA BB 06 00 00 00 00 01 01 0C</i> |
| <i>RF module ->host</i> | <i>AA BB 06 00 00 00 0C 01 00 0D</i> |
| <i>Step 4: Card search</i> | |
| <i>Host ->RF module</i> | <i>AA BB 06 00 00 00 0C 01 01 0C</i> |

| | |
|--|--|
| <i>RF module ->host</i> | <i>AA BB 12 00 00 00 01 30 C5 85 63 80 10 9D 09 19 00 00 80 1D</i> |
| <i>Note: C5 85 63 80 10 9D 09 19 in step 4 is the read UID serial number</i> | |

Table 8: RF Module Operation Test Instructions.

4.2 Communication Module Test

The handheld attendance machine communicates with the PC for attendance data upload, student information download, etc., using USB-A and USB-B extension cables to connect. Among them, there is a PL2303 module (USB to serial port) inside the hand-held attendance machine, which can facilitate the direct connection of computers without serial ports. The data format of serial communication is shown in Table 9.

| | |
|------------------|-----------------|
| <i>Baud rate</i> | <i>38400bps</i> |
| <i>Check bit</i> | <i>None</i> |
| <i>Data bits</i> | <i>8-bit</i> |
| <i>Stop bit</i> | <i>1-bit</i> |

Table 9: Serial Communication Data Format.

The communication module test mainly tests the uploading of attendance data and the downloading of student information. Attendance data upload, upload the time information of students punching in; download student information, download the student's name table, UID table, photos, and hand-held attendance machine display font. For the test of uploading attendance data, first, use the USB cable to connect the handheld attendance machine and the PC, then log in to the host computer management software, select [Student Information 1 > Student Information Export 1 > Personal Information Export], and enter the required information in the opened window. Query the student number of the student. After confirmation, the devices will communicate with each other, and the queried student attendance information will be displayed in the window in the form of a list. To download the student information, the relevant information of the student needs to be manually entered in the management software of the PC in advance. Then, use the self-made gadget in the management software to convert the name table, UID table, photos, and fonts into bin files. In the host computer management software, select [Online Communication 1 > Data Burning Tool], in this interface, burn the files generated above into the handheld attendance machine one by one until the operation is completed. The test results show that the generated data is accurate, and no abnormal data is found. Upload and download data communication is stable and fast, which meets the design requirements.

4.3 Precisely Predict Teaching Trends

Large-scale student management across the country started due to the COVID-19. Although the epidemic will eventually be brought under control, student management will not end with it. In the post-epidemic era, with the help of modern information technology, student management has been continuously developed and improved and has become the new normal in teaching. Precisely predicting the evolution trend of student management is an inevitable requirement to promote the reform of online teaching under the new situation. Taking teaching resources, content presentation and educational technology as examples, here is a brief study and judgment on the development trend of student management under the new situation, so as to spy on the new format of student management in the future. One of the teaching resources is from partial sharing to full sharing. Realizing the sharing of teaching resources among all staff is an important guarantee for solving the

long-term insufficient and unbalanced educational development. However, in the era when traditional offline teaching is the main method, teaching resources can often only be disseminated in a limited range, only shared by some students, and cannot be covered by all students. With the full intervention of modern information technology, online teaching has been continuously matured and perfected, and it has increasingly become an important teaching mode for students to acquire knowledge and grow. In the context of student management, teaching resources are no longer "private dishes" that only some students can enjoy, but "big food stalls" that all students can access, which fundamentally ensures the sharing of teaching resources by all. It can be seen that student management has effectively expanded the coverage of teaching resources and effectively resolved the problems of dispersion, fragmentation and imbalance of teaching resources. In view of this, education authorities and colleges and universities should take the student management reform as a strategic opportunity to break down departmental barriers, eliminate information silos, integrate resources, and realize sharing among all staff. The second is content presentation, which shifts from specifying teaching materials to generating content. The so-called designated textbooks mainly refer to the structured curriculum textbooks compiled by education authorities and colleges and universities according to the disciplines, majors, and personnel training goals. Because the designated teaching materials are dominant and authoritative, they often become the main basis for teachers to spread theories of knowledge to students. However, there is a slight deficiency that the designated teaching materials ignore the individual characteristics of students, so that the space for independent learning is quite limited. The improvement of student management quality is largely based on the individual needs of teaching content presentation. To effectively promote students' participation in student management activities, it is necessary to creatively transform teaching content, and promote the presentation of teaching content from fixed textbooks to generated content. Under the support of modern information technology, teachers should break through curriculum barriers based on precise thinking, use intelligent algorithms to mine and analyze students' personality characteristics, knowledge needs, learning styles, etc., and generate personalized teaching content under the premise of following the talent training goals. The third educational technology has shifted from comprehensive embedding to deep integration. Educational informatization comes with modern information technology, and educational technology plays a leading and promoting role in online teaching that cannot be ignored. With the effective intervention of educational technology, machine-assisted learning, program-assisted learning, and computer-assisted learning continue to promote the reform of teaching modes, making the boundaries between technology, and teaching increasingly blurred and the integration more and more closely. With the development of deep learning technology, the form of technology and teaching has changed from comprehensive embedding to deep integration. Of course, the inter-embedding and integration of technology and teaching is not a linear upward process, but a spiral upward trend. Technological development has brought about changes in teaching models, constantly giving birth to new teaching theories; and the innovations in teaching theories have deepened educators' cognition of the importance of technology and promoted the upgrading of teaching models with technological progress. The current integration of technology and teaching needs to be further improved, and with the orderly advancement of the construction of smart campuses, smart classrooms and smart courses, educational technology will bring innovative momentum and profound changes to the teaching model. To sum up, the key to the vitality and persistence of college student management lies in whether the quality of student management can be guaranteed. This paper takes precise thinking as the entry path and makes a preliminary discussion on the improvement of student management quality from the three dimensions of precise preparation, precise teaching, and precise supervision. At this time when student management is in the ascendant, education authorities, college administrators and educators must actively pay attention to student management, understand the dynamics of student management, clarify the advantages of student management, and grasp the laws of student management, and continuously promote the accumulation of student management from "quantity". The leap to "quality". Looking forward to the future, in the future, we

will continue to make coordinated progress in terms of educational technology investment, teacher quality improvement, teaching platform construction, and student learning guidance, and continuously improve the intelligence and accuracy of online teaching, so that student management will become the focus of teaching reform and innovation under the new situation. direction.

5 CONCLUSION

Based on precise thinking, this paper designs an attendance system for the management of middle school students in the COVID-19 through communication technology, which is beneficial to teaching and development. We have developed a student attendance system based on RFID technology. The whole system uses the second-generation ID card as the information identification body and adopt the attendance machine to record the daily attendance data of students. Experiments show that the authority of the operator is set to meet the actual needs of different users.

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