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CONTENTS

Research on Community Training for the Use of Smartphones by the Elderly

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Abstract: This article mainly introduces the training work on the use of smartphones for the elderly from six aspects. This includes the implementation background, training objectives, methods, content, and methods of training on the use of smartphones, the promotion and application of our team's training work, the results, difficulties encountered during the training process, and solutions, as well as reflections and experiences on the training work.

Keywords: Elderly people; Smartphonesl Community Training.

With the progress of society and the development of technology, using smartphones has become an inevitable social trend, and smartphones will also have more and more functions to meet the needs of modern people for entertainment, learning, and work. The elderly population, influenced by past lifestyle habits and ideologies, have relatively weak awareness of using the Internet, and have little or no access to it. With the rapid development of new media technology, they are unable to enjoy digital convenience and gradually become "internet refugees". In this aging society, learning how to use smartphones for the elderly not only helps them alleviate loneliness, improve their spiritual quality of life, integrate into modern society, but also reduces the pressure of young and middle-aged people taking care of the elderly, investing more energy in learning, work, and personal life planning[1].

1. IMPLEMENT BACKGROUND

In order to implement the spirit of the "Implementation Plan for Effectively Solving the Difficulties of Elderly People in Using Intelligent Technology" (Guo Ban Fa [2020] No. 45) and address the practical difficulties faced by the elderly in travel, medical treatment, leisure and entertainment service scenarios, Zibo Vocational College has launched a community training project for elderly smart phone classes to enhance their ability to use intelligent technology and help them enjoy a smart life, Improve the quality of life and quality of life.

2. SPECIFIC METHODS OF PROJECT TRAINING

2.1 Training objectives

(1)Assist elderly people in the community to proficiently master the basic operation of smartphones.
(2)Be able to download and install apps and use their functions correctly.
(3)Guide the elderly to be willing to use, make good use of, and enjoy intelligent travel technology, continuously enhancing their sense of gain, happiness, and security.

2.2 Implementation methods

(1)By conducting a smartphone class community training project, we aim to impart knowledge and skills to elderly friends, enabling them to adapt to the digital intelligence era as soon as possible, better integrate into society, and approach their later years with a more optimistic and open-minded attitude, planning their elderly lives.
(2)The project organizer and teaching team collect and analyze data to solve the practical problems encountered by the elderly in tourism travel, help them update their concepts and improve their application abilities
(3)The project training teacher team uses methods such as interviews and questionnaire surveys to collect data, understand the current situation of intelligent technology application ability of elderly people in the community, analyze specific problems, and do a good job in training elderly people in the community.

2.3 Implementation content

(1)Master the basic operations of smartphones, be able to download application software, and use commonly used tools such as flashlights, computers, cameras, weather forecasts, etc. The basic operations include setting the phone's main interface, turning on/off, adjusting volume, using the phone's navigation keys, using the phone's slide down and up function icons, how to make calls and create new contacts, one touch dialing settings, call recording, hands-free use, other device functions of the phone, input method selection, use of notes (memos), desktop adjustment, screenshot usage, battery maintenance, etc.
(2)The use of WeChat, including its entertainment and payment functions. The entertainment functions of WeChat include subscribing to official account, deleting official account, sending friends circle, browsing the updates of friends circle, adding friends, establishing WeChat group, voice call, video call. The payment functions of WeChat include binding bank cards, sending red envelopes, WeChat payments, WeChat receipts, daily expenses (gas, electricity, water, cable TV, etc.), booking train tickets, and booking hotels.
(3)Master the usage methods of Baidu Maps:Enable elderly people to familiarize themselves with Baidu Maps, become proficient in using location finding functions, public transportation query functions, travel

navigation functions, voice assistant automatic route finding functions, and understand the surrounding environment.

2.4 Teaching methods

(1)Use case study teaching method and explain with real cases from daily life scenarios.

(2)Using methods such as mobile phone screen projection and courseware display to explain to the elderly.

(3)Based on the characteristics of the elderly, a mobile phone screen projection method is used to demonstrate the teaching and equipped with a guide teacher's hand to guide each step of the operation. A large font courseware is designed for the elderly, displaying actual operation pictures for them to repeatedly watch and practice.

3. PROMOTION AND APPLICATION

In December 2021, our school and the Municipal Community Education Guidance Center held the opening ceremony of the city's elderly intelligent technology application teacher training class.

In January 2022, the project team held a "Smart Elderly Assistance" community training in the high-tech zone.

In July 2022, I was invited to participate in the "Double Registration" activity held in Xiaoxihu Community.

In 2023, the sub community project team will conduct training in multiple communities in Zhangdian District.

4. ACHIEVEMENT EFFECTIVENESS

In 2022, the project was selected as one of the first batch of recommendations for the "Smart Elderly Assistance" program by the Ministry of Education, and was awarded the title of "Smart Elderly Assistance" high-quality education and training project.

On January 22, 2022, the Dazhong Daily reported on the training activity on Luzhong Network.

On January 25, 2022, the high-tech zone government platform reported.

5. DIFFICULTIES ENCOUNTERED AND SOLUTIONS

As a modern product, smartphones have fast updates and a wide range of functions. The touch screen operation is vastly different from the button based operation that elderly people are accustomed to, and the way software interacts is also significantly different from the physical object operation that elderly people are accustomed to. Elderly people often experience frustration when using smartphones, which over time leads to the phenomenon of difficulty in using smartphones.

From the perspective of design psychology, there are three main reasons why elderly people find it difficult to use smartphones:

(1)There is a deviation between elderly people's understanding of smartphone interface design and interaction forms and that of young people[2].

(2) Due to intellectual reasons, the ability of elderly people to master new products is poorer than that of young people.

(3) The elderly have no need or interest in the new generation of electronic products such as smartphones, and their learning motivation is not as strong as that of young people[3].

Based on the above analysis, the solution is as follows.

(1)Enhance the interest of the elderly

Interest is the main influencing factor in promoting the implementation of smartphone application training for the elderly. Through data analysis and observation, it can be seen that the attention of the elderly to smartphone application training is more focused on how to use their phones for entertainment activities and simple tool use. Only by tapping into the psychology of the elderly can we accelerate the implementation of smartphone application training for the elderly.

(2) Hierarchical training for different personnel

The acceptance level of smartphones varies among elderly people of different age groups due to memory issues, insufficient understanding of smartphone application training, and insufficient mastery of relevant smartphone operation methods. Therefore, it is necessary to provide systematic guidance to improve the smartphone operation methods of elderly people. Therefore, it is necessary to provide systematic guidance, Improve the quality of smartphone application training for the elderly.

6. REFLECTION AND EXPERIENCE

6.1 Proficient foundation

Mastering the basics proficiently is a necessary requirement for all learning. Repetitive practice is the best way to solve this problem.

6.2 Easy to seek refuge

That is to avoid operations that are more profound and difficult for the elderly, and use vernacular instead of professional terminology.

6.3 Highlight key points

There are some important operations that elderly people must learn when learning smartphones, such as highlighting the key points, otherwise it will create obstacles to future learning and affect their enthusiasm for learning.

6.4 Emphasize practicality

In addition to answering and making calls, receiving and sending messages, smartphones also have a lot to help students master as soon as possible, so that they can be convenient and practical in daily life.

6.5 Interest driven

Interest is the best teacher, and elderly students learn smartphones because of their interest in certain software, which provides us with a good starting point for teaching. After mastering the necessary basic operations and skills, we can teach these students to learn the apps they are interested in[4].

6.6 Draw inferences from one example

With a certain foundation and learning how to operate some apps, one will find that smartphones have many

similar functions and apps in operation. Therefore, students should pay attention to these similarities or similarities during the learning process, and using them frequently can achieve the goal of drawing inferences from one example, making learning more relaxed and comfortable.

6.7 Smartphones are in an open network environment and carry certain risks

Elderly people are likely to be deceived, poisoned, or spread rumors when using smartphones. Therefore, it is necessary to improve their awareness of prevention. Do not use WIFI hotspots from unknown providers. If you are in a store that offers free WIFI hotspots, the store will definitely announce the WIFI hotspots and connection passwords it provides. Other unknown WIFI hotspots should be avoided as much as possible.

Before downloading an App from a smartphone, it is important to check whether the required permissions are related to the functionality of the App.

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Study on the Implementation Pathways for "On-Site Engineer Training" in Vocational Education

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Abstract: Targeting key sectors such as advanced manufacturing, strategic emerging industries, and modern services, the new model of talent cultivation in China focuses on training on-site engineers who are skilled in operations, knowledgeable in processes, capable in management, adept at collaboration, and innovative. This paper first analyzes the current issues in vocational education for on-site engineer training from three aspects: top-level design of the training model, the scope of "school + enterprise" collaboration, and talent selection and evaluation mechanisms. It then examines the engineering talent models in Germany and the United States, concluding that vocational education for on-site engineers should focus on the entire product lifecycle, strengthen the implementation of engineering education paradigms, and emphasize both internal and external collaborative innovation. Finally, guided by Bourdieu's field theory, the paper offers practical pathways and suggestions in six areas: integration of industry and education, master-craftsman teaching teams, educational models, modular curriculum systems, cultivation of humanistic qualities, talent evaluation, and more.

Keywords: Field Theory; Vocational Education; On-Site Engineers.

1. INTRODUCTION

On-site engineers represent the advanced goal-setting in vocational talent cultivation. The training of on-site engineers embodies technical logic, focusing on the acquisition of "knowledge-based skills" and problem-solving abilities, aiming to produce "craftsmen" with unique technical knowledge, technical thinking, and technical ethics, thereby achieving rational "creators." Training on-site engineers enhances the adaptability of vocational education to industry, accelerates the systematic development of engineering talent cultivation, and improves the quality of integrated vocational and scientific education[1].Specialized training programs for on-site engineers are carried out through school-enterprise joint programs, coordinating supply and demand between schools and enterprises, innovating talent cultivation models, and comprehensively reshaping talent cultivation systems, standards, and quality evaluation mechanisms. The training of excellent engineers and on-site engineers contributes to the formation of a gradient training system for excellent engineers, on-site engineers, technicians, and industrial workers. It encourages the establishment of permeable mechanisms between vocational and general education, smooths the pathways for the growth and success of skilled technical talents, and promotes diverse student choices and multiple pathways to success[2-3]. How to construct the "school + enterprise + professional field + on-site engineer joint training program" targeting advanced manufacturing, and how to train on-site engineers in vocational education are fundamental questions that urgently need clarification and answers. Therefore, current research focuses on thinking modes such as research-based, theoretical, practical, and process-oriented thinking, delving into the adaptive characteristics of "on-site engineer" training, clarifying the capability framework of on-site engineers, undertaking long-term talent cultivation model reforms, and establishing the operational mechanisms and standards for "on-site engineer" academies with Chinese characteristics[4].

2. JOINT SCHOOL ENTERPRISE CONSTRUCTION OF HIGH END EQUIPMENT INDUSTRY EDUCATION INTEGRATION COMMUNITY

The Industry-Education Integration Community is led by leading enterprises, high-level universities, and vocational schools, with schools, research institutions, and upstream and downstream enterprises participating across regions. Drawing inspiration from Germany's Fraunhofer model and leveraging regional intelligent manufacturing resource hubs, the community forms an educational chain in intelligent manufacturing. This chain is closely matched with the intelligent manufacturing industrial chain represented by enterprises, integrating various elements such as human resources, finance, materials, and systems. An open industry collaborative innovation platform is established under government guidance and enterprise leadership. This addresses weak links in perception, control, decision-making, and execution through industry-academia-research joint innovation[5].A series of systems are developed, including the "High-End Equipment Industry-Education Integration Community Charter," "Quality Assurance System," and "Operational Management System," to construct a "Five Co-" mechanism. This involves joint talent

cultivation plans, shared resource mechanisms, mutual staff appointments, joint training base construction, and comprehensive talent quality evaluation[6].

3. BUILDING A MASTER CRAFTSMAN TEAM FOR VOCATIONAL EDUCATION "ON-SITE ENGINEERS"

Focusing on the requirements of "Intelligent Transformation and Digital Transition," timely actions are taken to lay out new professions and implement skill enhancement actions like "Digital + Resources," "Digital + Teaching Methods," and "Digital + Training." A platform for the inheritance and innovation of skills and techniques is built, forming a teacher innovation collaborative community. Through division of labor and collaboration, complementary integration of specialized and general teaching staff is achieved, along with cross-integration of teaching fields and mutual integration of cultural education and technical skill training. A "1+1" dual mentor cultivation mechanism is implemented to build a well-structured, complementary, and distinctive master craftsman team for vocational education "on-site engineers."

4. INNOVATIVE "THREE-STATIONS-ONE-BODY COORDINATION, PRE-JOB AND POST-JOB INTEGRATION" ON-SITE ENGINEER EDUCATION MODEL

Based on the requirements of the Ministry of Education's "Special Training Plan for On-Site Engineers in Key Areas of Advanced Manufacturing," a school-enterprise collaborative standard for the construction of on-site engineer academies and talent cultivation plans in key areas of advanced manufacturing is developed. Jointly, schools and enterprises formulate "Detailed Rules for the Implementation of On-Site Engineer Training Pilot Work," develop teaching plans, course standards, job standards, quality monitoring standards, credit management methods, flexible academic system management methods, on-campus practical training plans, and enterprise rotation internship plans. This standardizes the operation mode of the on-site engineer academy. Employment-oriented, the main thread is the cultivation of occupational abilities required by enterprises for on-site engineers. Through school-based ("Frontier Station") courses in humanities and general capabilities, foundational skills are established. Pre-job training for specific posts is completed at the on-site engineer academy ("Refueling Station") through means like "transplanting" key courses in intelligent manufacturing and embedded teaching. Post-job competency is enhanced through enterprise-based ("Training Station") on-the-job training and enterprise training.

5. RECONSTRUCTING THE "1+X+N" MODULAR CURRICULUM SYSTEM FOR ON-SITE ENGINEERS

Adhering to an outcome-oriented philosophy, a

"Three-Party Collaboration, Education-Training Integration, Three Products Penetration" approach is adopted. Schools are responsible for professional theoretical courses and basic skill training, while training centers handle job-specific skill courses. In alignment with intelligent manufacturing processes, schools and enterprises collaboratively revise talent cultivation plans and transform real enterprise case resources into projects. This extracts quantitative and assessment requirements for "artifacts, finished goods, and products," reconstructing a "Platform + Module + Project" curriculum system. Using projects as carriers, 24 technical skill training modules are created, forming a digital resource system for on-site engineer training rooted in culture and enterprise production projects. High-quality enterprise training courses and project training packages are introduced. The abilities to create artifacts, prototype finished goods, and develop products are integrated throughout the talent cultivation process, aligning educational outcomes with industrial needs and achieving a win-win between student training and enterprise product development and promotion.

6. CREATING A THREE-DIMENSIONAL EXPERIENTIAL LEARNING PLATFORM

A "Teaching Classroom + Work Classroom + Cloud Classroom" structure is built. The teaching classroom uses integrated theory-practice training rooms as carriers, completing theoretical knowledge learning and single skill point training in modules. The work classroom is led by enterprise robot production cases, using skill competitions and 1+X vocational skill assessment equipment as carriers. It accomplishes more complex practical projects and comprehensive skill training through job-course-competition certification integration, combined with new standards, technologies, and processes. The cloud classroom is based on the "Internet+" concept, Through the construction of five vocational education intelligent and digital application scenarios of "teaching, learning, management, training, and evaluation", the reform of hybrid education model is deepened, and the "classroom revolution" is expanded from "45 minutes" to the all-factor classroom in class and outside class, online and offline,utilizing next-generation information technologies like VR/AR for cross-temporal learning and remote virtual simulation training. The teaching classroom mainly inspires teaching, guiding students in experiential knowledge learning. The work classroom strengthens the "training" function, aligns with actual work scenarios, solves real problems, masters technology, trains skills, and internalizes professional ethics. Under teacher guidance, students participate to gain personal experience, then reflect and summarize observations, deriving theories or outcomes for practical application. The cloud classroom focuses on "evaluation," using cloud technology to accurately gauge student performance, offering online virtual training

experiences, and breaking down barriers to practical classroom learning.

7. CONSTRUCTING A TALENT EVALUATION MATRIX ACROSS FOUR DIMENSIONS: INPUT, PROCESS, OUTPUT, AND ADDED VALUE

The implementation process of on-site engineer talent cultivation is premised on certain input factors, combined through specific teaching methods, and aims to achieve certain teaching outcomes. During the teaching implementation process, learners are influenced by factors at the macro level (enterprise field), meso level (teaching practice field), and micro level (learner field). Technical means are reasonably utilized to dynamically track, diagnose, and scientifically depict various types of data. Reforms are made to the formative evaluation methods in education to promote data interoperability, advance the comprehensive data collection of student qualities, and effectively enhance the level of digital governance.

8. SUMMARY

Targeting key fields such as advanced manufacturing, strategic emerging industries, and modern service industries, cultivating on-site engineers who are proficient in operation, process, management, collaboration, and innovation is a new model for cultivating apprenticeship talents with Chinese characteristics.Only by deeply exploring the adaptive characteristics of "on-site engineer" training, clarifying the ability structure of on-site engineers, and carrying out the reform and practice of long-term talent training mode, can we better guide and promote the continuous training of on-site engineers.

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Animal Model of Liver Disease: Heterotopic Transplantation Model of Human Hepatocellular Carcinoma

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Abstract: Liver diseases are significant health problems globally, including hepatocellular carcinoma (HCC), a highly aggressive and recurrent malignant tumor. Animal models play a crucial role in further understanding the pathogenesis of HCC and searching for more effective treatment strategies. In this study, we introduced a human hepatocellular carcinoma xenograft model, which involves the transplantation of human liver cancer cells into the mouse liver for observation and investigation.

Keywords: Hepatocellular Carcinoma; Heterotopic Transplantation; Modeling Method.

1. INTRODUCTION

According to the GLOBOCAN 2020 global cancer statistics, the annual incidence of liver cancer reaches 905,677 cases, accounting for 6.7% of the total cancer cases [1]. In 2020, it was estimated that there were 830,180 deaths from liver cancer globally, accounting for 8.3% of total cancer deaths and ranking it third in terms of cancer mortality. The heterotopic transplantation model of human hepatocellular carcinoma (HCC) can reproduce human diseases and provide a valuable platform for the study of disease pathophysiology and preclinical evaluation of novel therapies. In this paper, the authors introduce the method of generating subcutaneous or orthotopic heterotopic transplantation models of human liver cancer using immunodeficient mice as the basis, hoping to provide some assistance to researchers in the field of liver cancer.

2. MODELING METHODS

2.1 Processing of human liver cancer specimens

Primary human liver cancer specimens should be obtained with written consent from the patients and approved by the institutional research ethics committee, as well as the University Health Network Research Ethics Board, in compliance with all institutional, national, and international guidelines on human welfare.

Ideally, processing should be done within 30 minutes of tissue removal from the patient. Samples of at least 1 cm3 obtained from around the tumor are preferred, as the central part of the tumor may be necrotic. Patients undergoing tumor resection should ideally not have received any prior treatments such as radiation, chemotherapy, or ablation, to maximize the chances of tumor cell survival. Human tissue should be handled according to personal protective protocols for biohazardous materials. All laboratory manipulations of tumor tissue and cell preparations should be performed using aseptic techniques within a biosafety level 2 cabinet.

(1) Place fresh HCC samples in 10-25 ml of serum-free Dulbecco's Modified Eagle Medium/Ham's F12 at 4-25°C and transfer them to the laboratory on ice for immediate processing and preparation of tissue fragments or cells for transplantation into mice.

(2) Use sterile forceps to place the tumor sample in a 100 mm x 20 mm culture dish or other suitable sterile work surface. Use a size 10 surgical scalpel blade to divide the tumor sample into approximately 2-3 mm3 fragments. At this point, certain tumor fragments may be rapidly frozen or formalin-fixed for further experiments or analysis, as needed.

(3) For heterotopic transplantation of tumor fragments, place some HCC fragments in one or more microcentrifuge tubes containing sufficient Matrigel to keep the fragments submerged. Place these tubes on ice.

(4) To prepare a tumor cell suspension, use a surgical scalpel blade to finely chop the remaining HCC tissue as much as possible and mix it with 5-10 ml of DMEM-F12 in a 50 ml conical tube, according to the volume of the minced tissue.

(5) Add Type IV collagenase and Type II dispase at final concentrations of 200 units/ml and 0.8 units/ml, respectively. Use a 25 ml pipette to mix the mixture up and down to ensure thorough mixing.

(6) Seal the tube and incubate the mixture at 37°C in a 5% CO_2 incubator for 30-60 minutes, depending on the softness of the tumor tissue. Every 10 minutes, pipette the mixture up and down several times to assess the progress of enzymatic digestion.

(7) After digestion is complete, pass the tumor solution through a 100 μm cell strainer. Use the tip of a 25 ml pipette to lightly triturate the residual tissue on the cell strainer to allow the maximum number of tumor cells to pass through. Collect the cell suspension in a 15 ml conical tube.

(8) Centrifuge the tumor cell suspension at 1200 rpm for 5 minutes at 4°C.

(9) Gently pour off the supernatant. Depending on the size of the pellet, add 2-5 ml of cold 1x red blood cell

(RBC) lysis buffer and gently pipette up and down to resuspend the pellet. Incubate on ice for 5 minutes.

(10) Add DMEM-F12 to a total volume of 15 ml and centrifuge at 1000 rpm for 5 minutes at 4°C to wash away the RBC lysis buffer.

(11) Gently pour off the supernatant, then resuspend the tumor cell pellet in DMEM-F12 without RBC.

(12) Count the viable cells using the trypan blue exclusion method (manual or automated cell counter) as needed.

(13) Divide the tumor cell suspension into smaller aliquots as required. Centrifuge the desired quantity of the injection-ready tumor cells at 1200 rpm for 5 minutes and resuspend the resulting cell pellet in 30 μl of frozen Matrigel. Store on ice.

2.2 Heterotopic transplantation

Use equipment that delivers inhalational volatile anesthetics to small animals according to the standard operating procedures of the animal facility and research institute. Use aseptic techniques and sterile instruments in a biosafety level 2 cabinet for all surgical procedures. Utilize male and female NOD-SCID or NSG strain mice between 6-8 weeks of age, which should be housed and maintained under pathogen-free conditions suitable for immunodeficient animals.

Prepare the mice for surgery indoors and administer isoflurane inhalation anesthesia with 5% (v/v) in 1 L/min of oxygen. Maintain anesthesia until corneal and toe reflexes in the animals have disappeared. For subcutaneous heterotopic transplantation, shave one or more small areas on the back of the animal and clean the skin with 70% ethanol. For orthotopic liver transplantation, shave the abdominal area of the animal from the armpit to the groin and clean the skin with 70% ethanol [3].

2.2.1 subcutaneous implantation of tumor fragments

(1) Place the anesthetized mouse in a prone position and maintain inhalation of isoflurane anesthesia through a nose cone (1 L/min O2 containing 2% (v/v) isoflurane). Apply ophthalmic ointment to protect the animal's eyes from injury.

(2) Disinfect first with 70% ethanol, and finally with povidone-iodine solution.

(3) Make a 5 mm skin incision using sterile sharp scissors.

(4) Gently insert a closed-blunt scissors into the subcutaneous space and gently spread to create a pocket large enough to accommodate the tumor fragment.

(5) Use sterile fine forceps to insert the prepared tumor fragments from step 1.3 into the subcutaneous pocket.

(6) Close the skin incision with sutures or clips.

(7) Provide postoperative care for the mice as described in step 2.5 below.

2.2.2 subcutaneous injection of tumor cells

(1) Prepare the animals as described in steps 2.2.1(1) and 2.2.1(2).

(2) Draw the tumor cell suspension prepared in step

1.13 into an insulin syringe with a 29 G 1/2 needle attached.

(3) Insert the needle into the subcutaneous space and dispense the contents of the syringe. Move the needle a few millimeters away from the skin puncture site along the subcutaneous plane to prevent leakage of the tumor cell suspension upon needle withdrawal.

(4) Provide postoperative care for the mice as described in step 2.5.

2.2.3 intrahepatic implantation of tumor fragments

(1) Use a 27 G 1/2 needle on a 1 ml syringe to inject 350 μl of sterile saline subcutaneously in the neck area of the anesthetized mice to compensate for fluid loss during the surgery. For analgesia, inject 350 μl of sterile saline containing buprenorphine (0.1 mg/kg) subcutaneously on the flank of the animal.

(2) Place the mouse in a supine position on a preheated pad with the nose and mouth in the nose cone to provide maintenance inhalation anesthesia with isoflurane (1 L/min O2 containing 2% v/v isoflurane).

(3) Extend the limbs and secure them to the surgical table with tape to fully expose the abdomen and thorax.

(4) Ideally, perform the procedure under magnification for improved operability.

(5) Disinfect with 70% ethanol, followed by povidone-iodine solution.

(6) Make a transversal bilateral subcostal skin incision with sterile sharp scissors, dividing the muscle layers to enter the peritoneal cavity and fully expose the liver.

(7) Create 3 mm long and deep incisions on the liver surface using a size 10 sterile surgical blade.

(8) Immediately apply Surgicel hemostatic gauze to the incision site and gently apply pressure to stop bleeding. Remove it after 60-90 seconds when complete hemostasis is achieved, and proceed to the next step.

(9) Insert the tumor fragments prepared in step 1.3 into the liver incision using sterile forceps or an 18 G needle.

(10) Place a small piece of Surgicel on the incision site to prevent displacement of tumor fragments and ensure continuous hemostasis.

(11) Close the skin incision with sutures or clips.

(12) Provide postoperative care for the mice as described in step 2.5.

2.2.4 intrahepatic implantation of tumor cells by direct injection into the liver

(1) Prepare the mice as described in steps 2.3.1 to 2.3.7 above.

Load the tumor cell suspension prepared in step 1.13 into an insulin syringe with a 29 G 1/2 needle.

(2) Insert the needle of the insulin syringe into the liver and advance it a few millimeters along the ventral plane.

(3) Gently dispense the contents of the syringe and then withdraw the needle from the liver.

(4) Place Surgicel on the puncture site and apply moderate pressure with a cotton swab to 2.4.5 prevent leakage of the tumor cell suspension and achieve

complete hemostasis.

(5) Close the incision with sutures or clips and provide postoperative care as described below.

2.2.5 postoperative care

(1) Remove the mice from the inhalation anesthesia apparatus.

(2) Place the mice in a cage under a heat lamp for approximately 20 minutes until they recover from anesthesia and fully regain movement.

(3) Repeat administration of buprenorphine every 8-12 hours during the initial 2-3 days postoperatively.

3. ANALYSIS OF THE APPLICATION SCENARIOS OF MODELING METHODS

Subcutaneous xenografts generated from tumor fragments exhibit rapid generation, ease of monitoring, and may be more suitable for local administration of new therapies with convenient tumor response monitoring.

Intrahepatic xenografts are more relevant to the role of the liver microenvironment in hepatocellular carcinoma biology. As shown in Table 1,Xenograft models generated from tumor cell suspensions are primarily used for the identification and characterization of subpopulations of tumor-initiating cells or for experiments that require in vitro manipulation of tumor cells prior to xenografting.

Table 1. Implantation Rates of Various Modeling Tumors

Modeling type	Tumor implantation rate
Subcutaneous implantation of tumor fragments	16.9%
Subcutaneous injection of tumor cells	10.9%
Intrahepatic implantation of tumor fragments	46.2%
Intrahepatic implantation of tumor cells	Low implantation rate

4. CONCLUSIONS

The heterotopic transplantation model of hepatocellular carcinoma in humans is currently the closest liver cancer model to clinical research. It is used for personalized drug screening, biomarker identification, preclinical drug evaluation, and the study of biological mechanisms. It holds significant translational significance for tumor early assessment, treatment, and prognosis. In the establishment of the heterotopic transplantation model of hepatocellular carcinoma in humans, considering the survival rate of the transplanted mice and the tumor engraftment rate, it is recommended to use the currently more mature methods of subcutaneous implantation of tumor fragments or intrahepatic implantation of tumor fragments for modeling (survival rate: subcutaneous implantation of tumor fragments > intrahepatic implantation of tumor fragments).

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How to Improve the Student's Concentration of "Botany" Course in the Smartphone Age

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Abstract：In the smartphone age, students are easily attracted by all kinds of interesting online information, videos and games, which weaken students' concentration and learning enthusiasm in class and makes them "phubbers" in class. The course of "Botany" is a basic professional course of biology, agriculture, forestry, landscape, horticulture and other disciplines in ordinary colleges and universities. How to improve the concentration of students in "botany" class and better participate in classroom teaching can start with the reform of teaching content to improve the systematic, informative, practical and interesting contents of classroom teaching. At the same time, we discuss the reform of classroom teaching modes and teaching methods, through the use of guided, story, example teaching methods, on the basis of PPT teaching, adding short video, animation and other forms of expression. Through various forms of reform, improve students' concentration in the classroom, and then stimulate students' enthusiasm for learning, so that students are willing to listen, can understand and remember the teaching contents, can obtain some inspirations, and finally master the basic principles and technologies of "botany".

Keywords: Smartphone Age; Botany; Concentration; Educational Reform

Shaoyang University is an application-oriented comprehensive university with 11 disciplines and 52 undergraduate majors, which was formed by the merger of the former Shaoyang Normal College, the former Shaoyang Junior College and the former Shaoyang Medical Junior College. In 2018, it was identified as a "double first-class" high-level application characteristic university in Hunan Province. The Landscape architecture major of Shaoyang University was founded in 2000, and it was approved by the Ministry of Education to establish the undergraduate major in 2006. It was designated as first-class undergraduate major construction point in Hunan Province in 2020.

"Botany" is a basic professional course for landscape architecture majors. Students will use the knowledge and technology related to botany for further study or work. The textbook chosen has always been "Botany" edited by Ma Weiliang, supplemented by the original English book "Botany - An introduction to plant biology" edited by James D. Mauseth, and "Stern's introduction plant biology" edited by James E. Bidback.

Smartphones seem to have become a lot of people's "external chip", behavior is controlled by the phone and can't extricate themselves. Almost all college students have smartphones, and some of them are more likely to be attracted by interesting Internet information, wonderful videos and games. Moreover, professional courses are relatively boring. Away from parents' supervision, these students gradually become "phubbers" in class, which greatly weakens their concentration and learning enthusiasm in class. It also affects the whole classroom learning atmosphere and teacher-student interaction. The number of "phubbers" in college classes across China is expanding, and the "head-up rate" is decreasing, and it has gradually spread in recent years. How to control smartphones, make the phones serve for teaching, and improve the "head-up rate" in classroom teaching have gradually become the focus of teaching reform research of university teachers. This paper takes "Botany" course as an example to discuss the teaching reform of related courses for improving the Student's Concentration in class.

1. THE REFORM OF TEACHING CONTENTS

The "Botany" textbook edited by Ma Weiliang is divided into 13 chapters, mainly including the basic structure of plant cells, plant tissues and organs, the main characteristics and representative plants of various phyla of plants, and the adaptation of plants to the environment[1]. The textbook has been published in the third edition and has gradually formed a relatively complete knowledge system. Teaching can be done gradually according to the chapters. However, the teaching contents are still complicated, difficult to memorize and understand, and students are not interested. Therefore, it is necessary to improve and reform the teaching contents in the following aspects:

1.1 Introducing cutting-edge scientific and technological knowledge

Biology is the fastest-growing field, and as a branch of biology, botany has developed rapidly. It is difficult for textbooks to cover the progress of cutting-edge science and technology. Collecting and explaining the important research progress of botany in recent years and the knowledge points related to botany awarded by the Nobel Prize each year are all points that arouse students' concentration and interest. Selecting parts of these knowledge for special presentations or integrating relevant knowledge into existing chapters during the course explanation process, keeping up with the times, will greatly enhance students' interest

in the course. For example, Li Dezhu's team from the Kunming Institute of Botany, Chinese Academy of Sciences, used the single nucleotide polymorphisms data obtained from genome sequencing to support that the genus *Melocalamus* is a monophyletic group[2]; The East African Flora and Taxonomy Discipline Group of the Chinese Academy of Sciences Wuhan Botanical Garden has revised the classification of the genus Kumquat, solving the problem of the systematic status and subordinate classification of the traditional genus *Kumquat*[3]. These two examples can serve as supplements to the knowledge points of the "taxonomic hierarchy of the plant world", so that students can understand that scientific research and discovery are fallible, and it is a process of constantly shielding and correcting errors, and constantly verifying, modifying and perfecting. The example of the Wang Yinzheng team of the Institute of Botany of the Chinese Academy of Sciences found that a new cell type (contractile cells with a much-expanded rough endoplasmic reticulum) related to organ movement for selfing in plants[4], which can be used as a supplement to the content of "plant cells"; Du Juan's team from the Institute of Plant Biology, College of Life Sciences, Zhejiang University first discovered that phloem cells and xylem cells are formed by two types of stem cells with different morphological structures and characteristic expression genes[5], which can be used as knowledge compensation for "plant tissue". The latest developments, such as the discovery by scientists of the origin and evolution of hexaploid cultivated oats[6], the evolution process of parasitic plant genomes in the *Orobanchaceae* species[7], and the early genome evolution process and patterns of monocotyledonous plant ancestor *Acorus tatarinowii*[8], can serve as supplements to the knowledge points of "plant origin and systematic evolution". The latest research has found that a small crustacean can help pollinate red algae[9], which can serve as a supplement to the knowledge of the synergistic relationship between plants and environmental organisms. Combining the latest knowledge with textbook content not only enriches the classroom teaching contents, but also stimulates students' interest in learning.

1.2 Integrating knowledge into daily life

Combining textbook knowledge with daily life will make rigid knowledge more vivid and easier to stimulate students' interest. For example, when explaining algae plants, we can introduce the oxygen released by algae in the ocean accounts for 70% of the oxygen content of the earth's atmosphere, algae foods such as kelp and laver that we often eat, and algae hazards such as water blooms and red tides, and also introduce the concept of "blue agriculture" for students to think about. When talking about fungi, the identification of common edible wild mushrooms and an introduction to common mushroom cultivation

techniques can be introduced; It can also introduce the discovery process of various antibiotics, as well as the thinking of antibiotic abuse. When explaining the reproductive organs of plants, we can explain the cultivation process of seedless watermelon and the asexual reproduction techniques of plants. When explaining various representative plants, we can introduce common wild vegetables, such as purslane, bracken fern, Chinese toon, chrysanthemum, perilla, etc.; Common poisonous plants can be introduced, such as oleander, mandala, wisteria, daffodil, periwinkle, etc.; Common Chinese herbal medicines can be introduced, such as honeysuckle, plantain, dandelion, shepherd's purse, ginkgo, etc.; Common invasive alien plants can be introduced, such as Canadian goldenrod, purple stem eupatorium, water hyacinth, hollow lotus seed grass, thorny amaranth, etc. In addition, a large number of poems in China also involve many plants, which can also be appropriately applied in the classroom, such as "Lotus leaves, green and exuberant, merge with the blue, their flowers, sun-tinged red, look exceptionally fine", "The budding moss is small as grain, the beauty of peony it tries to gain", "Emerald fashioned into a tall tree, hung with myriad silk braids of green", "The affectionate peonies are in spring tears, while the roses lie languishing on the morning twigs" and so on[10]. The integration of textbook knowledge into daily life can not only solve students' doubts, but also enable them to experience the application of botany knowledge in real life, increase students' interest and motivation in learning, and improve their concentration on classroom learning.

2. THE REFORM OF TEACHING METHODS

In a good classroom, students' thinking unfolds with the teacher's explanation. They can understand most of the knowledge taught by the teacher in class, then use after-school learning resources for review and reflection, and fully understand and master all the content taught by the teacher. The current teaching method mainly relies on teacher explanations, supplemented by student assignments and self-study. In this teaching method, there is a lot of explanation content in the classroom, but students may find it difficult to concentrate and fail to achieve the ideal learning effect. "Botany" is a professional foundational course, but it is also full of knowledge, practicality, and interest. A large number of stories can be cited, so various forms of teaching such as guidance, inspiration, examples, and stories can be used to explain the course, stimulate students' interest in learning, and stimulate their learning enthusiasm.

Inspiration teaching refers to asking more questions in the classroom, such as "why is it like this", "how to understand", and "what is different", to encourage students to think, summarize, and compare. For example, "What is the difference between plant cells and animal cells?" Ask students to summarize the composition and structural characteristics of plant cells. Plant cells have cell walls, and some cells have

chloroplasts and large central vacuoles. So "why do plant cells have to have a cell wall?" The cell wall can resist microorganisms, prevent water from evaporating too quickly, and prevent excessive osmotic pressure from bursting the cell. "What is the structure and composition of the cell wall that has this function?" The cell wall can be divided into three layers: intercellular layer, primary wall, and secondary wall. The main chemical component is cellulose, followed by hydrophilic substances such as pectin, hemicellulose, non cellulose polysaccharides, and proteins. Through a series of questions, we can inspire students to connect multiple knowledge points.

Guidance teaching refers to guiding students to draw conclusions in the classroom. For example, in the main features of angiosperms, they can be guided one by one by connecting with the main features of gymnosperms. The seeds of gymnosperms are bare, with most seeds having two or more embryos that do not form fruits, while the seeds of angiosperms are not bare and are covered by a fruit peel. The embryo of the seed has one or two cotyledons that form fruits; Gymnosperms do not have true flowers composed of organs such as corolla, calyx, receptacle, and stamen, while angiosperms do; Gymnosperms are all woody plants, while angiosperms include both woody and herbaceous plants; There is no phenomenon of double fertilization in gymnosperms, while angiosperms have... These can be combined with the knowledge of gymnosperms and daily life, guiding students to draw their own conclusions.

Example and story teaching uses examples or stories to explain relevant knowledge, introduce text, or adjust the classroom atmosphere, because students like to listen to specific examples and stories. When talking about *Gramineae* plants, we will tell the story of Yuan Longping's desire to "enjoy the cool under the grass" step by step. This will be interspersed with explanations of the characteristics of *Gramineae* plants and related knowledge such as hybrid rice breeding. Through this story, we can stimulate students' research enthusiasm and understanding of textbook knowledge. When talking about plants in the *Compositae* family, you can tell the story of Tu Youyou who won the Nobel Prize for discovering artemisinin. When talking about the gymnosperms' *Taxopsida* class, you can cite the discovery process of paclitaxel, and when talking about the gourd family, we can cite the cultivation process of seedless watermelons.

3. THE REFORM OF TEACHING APPROACH

Add more vivid forms of expression such as images, animations, and short videos to the teaching PPT appropriately; If conditions permit, students can be brought out of the classroom and into the nature. They can grasp the laws of growth, development, flowering and fruiting in the "in one year, withers and thrives once each" of the plant world. At the same time, they can learn the collection, production and recording methods of various plant specimens, so that students can learn botanical knowledge in a relatively relaxed environment with a happy mood.

The contents of "Botany" can also be broken down by knowledge points, especially the botany related experiments, and the short network videos can be produced and placed on the popular short video platform for students, such as Tiktok, Kwai, Bilibili, etc., which can enable students to accept knowledge in a preferred way. At the same time, it is also necessary to establish an online teaching space, as classroom teaching hours are limited. Teachers can place courseware, lecture videos, reference books, latest literature, short videos, homework, etc. in the online space for students to review and self-study after class. At the same time, a question-and-answer section is set up in the online space, allowing students with questions to reply and answer. On the one hand, it can promptly answer students' doubts, and on the other hand, it can understand students' mastery of knowledge points.

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Reform of Mechanical Fundamentals Curriculum in Vocational Colleges

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Abstract: Mechanical design is one of the important skills for students majoring in electrical automation. Through the study of relevant courses, students can understand the characteristics, selection, and application of various components and transmission mechanisms. Therefore, mechanical foundation is a very important course. However, through actual teaching, it has been found that there are many problems in the implementation of this course. This article focuses on the problems that have arisen in the teaching implementation of the current mechanical foundation course, analyzes the reasons, identifies corresponding strategies, provides certain guidance for the teaching implementation of the course, and improves the teaching effectiveness of the course to a certain extent.

Keywords: Vocational Colleges; Mechanical Design; Transmission.

1. INTRODUCTION

Mechanical Fundamentals is a fundamental course in theoretical mechanics, material mechanics, materials science, mechanical drawing, and other professional knowledge. It is also a traditional basic subject education [4]. Its task is to enable students to master the necessary mechanical basic knowledge and skills, understand the types, properties, applications, etc. of mechanical engineering materials, and understand the mechanical working principles and technical requirements of commonly used mechanisms and typical components. Cultivate students' ability to analyze and solve problems, form good learning habits, and have the ability to continue learning electrical automation technology, laying the foundation for subsequent courses such as "Electrical Control Technology", "PLC Application Fundamentals", "Metalworking Training", and engaging in related electrical automation technology work. However, during the teaching process of this course, it has a strong theoretical foundation and involves many knowledge fields. It has been found that there are many knowledge points [1], abstract and difficult to understand content, and difficult to digest after class. Therefore, it is necessary to reform the curriculum to address the above issues.

2. ANALYSIS ON THE TEACHING PROBLEMS AND REASONS OF MECHANICAIL FOUNDATION COURSE

At present, in the process of teaching implementation, it is found that teachers perform well in teaching professional knowledge, but the feedback from students in the course implementation process and the exam scores of each final exam are unsatisfactory. According to the survey of teachers and students, the following problems exist in the course implementation process.

(1) The course content is extensive and complex, and the mechanical foundation covers multiple disciplines such as mechanics, mechanical design, and mechanical principles. On the one hand, teachers have a large amount of teaching tasks and cannot fully explain the knowledge and skills points within a limited time; On the other hand, students learn a large amount of theoretical knowledge in a short period of time, which poses significant difficulties. Some students have weak foundations and learning abilities, and a large number of knowledge points cannot be mastered and understood; At the same time, some of the content of this course is abstract and difficult to understand, and many students have low self-discipline in the classroom and lack strong learning enthusiasm, which can easily lead to a dislike of learning. The dislike of learning can easily affect the learning atmosphere of the entire class, affect teaching and learning effectiveness, and also affect the learning of subsequent professional courses.

(2) Virtual simulation needs to be improved. The content of the mechanical foundation course is relatively abstract, and students' understanding ability is limited, making it difficult to understand relevant knowledge and skills. As one of the new technologies, virtual simulation technology is gradually being widely applied in teaching. This technology can transform abstract things into reality through virtual and real conversion, playing a good auxiliary role in the implementation of course teaching. At the same time, most students have a strong interest in virtual simulation technology, and using this technology for auxiliary teaching can better stimulate students' learning enthusiasm. However, currently the school lacks virtual simulation equipment and teaching conditions, which cannot meet the needs of students in class.

(3) There is a serious disconnect between theoretical knowledge and actual production. Currently, students are only exposed to theoretical knowledge from textbooks, but there is still a significant gap between theory and practice. Students have fewer opportunities to engage in actual production in school and do not have the conditions to solve practical problems. How

to use the knowledge they have learned to solve practical problems has always troubled students, and some students are prone to the idea of "what is the use of learning this", Not conducive to the learning of other professional courses in the future, which in turn affects career planning and personal development.

(4) The teaching methods are too outdated to meet the requirements of the new era, many of which are not targeted, and even some methods have been phased out. Some teachers rely too much on PPT and old lesson plans, and read from books in class without innovation. Old teaching methods cannot stimulate students' interest in learning, and cannot interact well with them. The teaching process is too dull, and some students sleep, play with their phones, and chat in class, Resulting in a poor overall learning atmosphere.

3. TEACHING STRATEGIES FOR MECHANICAL FUNDAMENTALS

Based on the existing problems mentioned above, corresponding teaching strategies are proposed as follows.

(1) Adjust the training plan and curriculum standards, appropriately increase the relevant class hours, hold regular seminars, and delete content that has already been eliminated. In the classroom, teachers should balance theoretical explanation time with students' own practice time, use various teaching methods, mobilize students' learning enthusiasm, and allow them to participate more in the classroom, gain a sense of achievement during the class and practice process. Teachers should guide and encourage students, praise and reward students who perform well, stimulate students' learning enthusiasm, and enable them to complete learning tasks with high quality. At the same time, teachers promptly explain and correct common problems, making students willing to learn and ask, and improving the learning effectiveness and teaching efficiency of the course.

(2) Build a virtual simulation training platform, arrange professional personnel, and scientifically manage the training platform. At the same time, professional training will be provided to teachers to enable them to master platform operation methods and skills. Enable students to learn professional courses through virtual simulation training platforms, concretize abstract knowledge, make transmission mechanisms, components, and force states "visible and tangible", enable students to learn, understand, and be willing to learn, help students understand and master, and fully mobilize their subjective initiative. At the same time, provide relevant technical permissions to the teaching staff. For students who do not follow classroom discipline or do things unrelated to the classroom on the platform, the teaching staff can promptly detect and handle them.

(3) Regularly liaise with relevant enterprises, assign practical tasks to students and include them in the final performance assessment. Regularly arrange for students to exercise in the enterprise, recruit students

into the teacher's research group, and help teachers complete the research tasks. In the process of completing the tasks, strengthen their understanding of theoretical knowledge, improve students' learning efficiency, and master knowledge and skills points.

(4) By adopting information-based teaching methods and new teaching methods, students' learning enthusiasm is fully mobilized. Modern teaching methods such as task driven approach, integrated teaching and practice, and "three stages, six steps and four combinations[2]" are integrated into the classroom, allowing each student to participate in the classroom, increasing their sense of classroom participation, and making them the masters of the classroom.

(5) Intensify the construction of software and hardware for the fixture training room, optimize the layout and spatial design of the training room by integrating and configuring various training resources, enhance the comfort of the training environment, standardize and strengthen the management of the training room, and ensure the normal operation and continuous availability of the training room by updating, maintaining, and optimizing training equipment and facilities. Introduce advanced equipment and technology to improve practical training effectiveness and teaching quality. Increase investment in training funds, strengthen the construction of job responsibilities, management systems, operational norms, and processes in the fixture training room, and form a training room management system with clear job responsibilities, strict management systems, and clear operational processes. Implementing the student-centered teaching philosophy, the training room is open to the outside world, providing students with as many practical opportunities as possible. The aim is to cultivate students' practical and innovative abilities and improve teaching quality, with the reform of practical teaching as the core, the open sharing of practical resources as the foundation, and the high-quality experimental teaching team and complete experimental conditions as guarantees. The innovative management mechanism comprehensively improves the teaching level and the effectiveness of the training room. Build a teaching faculty team with a reasonable structure and rich professional knowledge, promote cooperation and exchange between the training room and enterprises, provide broader practical opportunities and resource support, fully utilize training equipment and professional talents, and ensure that the fixture training room plays a greater role.

(6) Pay attention to the ability training of teachers and improve their engineering literacy. Schools should carry out relevant skills training for teachers. In winter and summer holidays, teachers should first carry out technical training to improve practical ability and vocational skills, and strengthen the cultivation of self-

learning ability and problem-solving ability of teachers and students. At the same time, teachers are arranged to practice in enterprises in related industries, do experiments by themselves before class, and actively participate in scientific research work with engineering practice and design, and constantly accumulate practical experience in practical work. In this way, teachers' professionalism, professional ability and engineering quality are generally improved, the vividness and practicality of teachers' lectures are greatly improved, and students' interest in learning is also improved. Teaching effect and teaching quality have been significantly improved.

4. CONCLUSION

As one of the major courses of electrical automation, the Mechanical Foundation course has a large proportion in the talent training program of higher vocational colleges. Through the study of this course, students will be familiar with the norms, standards and methods of the machinery industry, have the ability to analyze the force of parts, select appropriate engineering materials, design simple mechanical structures, and improve their analytical ability and calculation ability. After learning this course, students can correctly apply the knowledge of mechanical design to complete related tasks according to different task requirements in the future work. At the same time, it also cultivates students' serious and responsible work attitude and rigorous and meticulous work style,

laying a good professional foundation for the follow-up core course study, and creating good conditions for further improvement and technical work in the future. In this paper, according to the typical problems exposed in the process of mechanical basic course teaching implementation, systematic analysis is carried out to find the causes of specific problems, determine solutions, and enhance students' interest, so as to achieve the perfection and improvement of the teaching effect of mechanical basic course.

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Research and Development Strategy of Large-Scale Container Ships

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Abstract: Large-scale container ship has become a development trend. This paper introduces the research background of large-scale container ship economy, analyzes the influence factors of large-scale container ship economy, and puts forward the research direction of large-scale container ship economy as well as the development strategy of large-scale container ship, so as to promote the development of large-scale container ship better.

Keywords: Large-Scale Container Ships; Ship Economy; Influencing Factors; Strategy.

1. INTRODUCTION

The large-scale ship transportation is a key area of research on ship economics in the shipping market in recent years, especially after the emergence of containers, the containerization of cargo is conducive to improving the circulation rate of cargoes, accelerating the transit of vehicles and ships, and also further promoting the development of combined transportation. The economics of large-scale container ship is also known as the focus of the research of the shipping industry.

For container liner shipping enterprises, containers are the second means of transport. The various costs of containers are directly related to the profits of liner shipping enterprises. Since the financial crisis in 2008, liner shipping companies have long been subjected to international economic ups and downs, and there is excess capacity, low transportation price and the state of supply exceeding demand. Due to the global uniformity of sea container, all liner shipping companies, port loading and unloading enterprises and other related units facilitate uniform transportation operations, and large-scale container ships have become the trend of container ship development. But with the development of this trend, its economy is increasingly concerned by ship owners, cargo owners and ship agency companies[1].

2. ANALYSIS OF THE ECONOMIC BACKGROUND OF LARGE-SCALE CONTAINER SHIPS

The development of international trade has given impetus to the development of the container transportation industry. Up to now, Maersk and Mediterranean Shipping Company have begun to operate 23,000TEU ultra-large container ships.

The development of international trade promotes the development of container transportation industry. Up to now, Maersk and Mediterranean Shipping Company have begun to operate 23,000 TEU super large container ships. How to get the bigger carrying capacity of container ship, the lower marginal cost and the maximum profit, this problem has been the focus of the large ship companies and shipbuilding enterprises. The upsizing of container ships can indeed bring economies of scale, but some companies are cautious about investing in very large-scale container ships. In the global financial crisis that broke out in 2008, due to the overall decline of the world economy, it directly affected the world shipping industry, resulting in the situation of excess ship capacity at that time. With the recovery of the shipping market in recent years, the study of ship upsizing has become more and more in-depth, and it has been proved that the economy of 10,000TUE ships in long-distance liner transportation is less than that of the current 20,000TEU container ships. Therefore, the economic research on the upsizing of container ships has practical guiding significance for major shipowners and shipping enterprises. By studying the marginal effect points of the upsizing of container ships, major shipping enterprises can achieve the purpose of reducing cost and increasing income.

3. ANALYSIS OF ECONOMIC FACTORS FOR CONTAINER SHIP LARGE SCALE

3.1 Economic analysis of large-scale container ship

Ship economic analysis has practical significance for shipyards and shipping enterprises, and its economic analysis can avoid the risks of investment, construction and operation. Under the influence of world economic integration and domestic and foreign market competition, the global Marine transport industry is developing towards large-scale. Ultra-large dry bulk carriers, oil tankers and container ships have become the trend of ship development. At the same time, major ports are also actively building ultra-large ports and actively promoting the development of large-scale ships. It can be seen from the economic study of ships that with the increase of ship size, the cost of unit deadweight ton and unit TEU will decrease inversely in the process of ship construction. Therefore, from the perspective of the operating costs of each large ship company, the critical point of economies of scale can be found through the operation of very large ships, and the purpose of reducing costs and increasing income can be achieved. At the same time, according to the container throughput forecast of the world's top ten ports and the analysis of the world economy, it can be seen that the global container business volume will

increase significantly in the future for a long time, which promotes the development of large-scale container ships to a certain extent. Therefore, the world economy and the upsizing of container ships interact and develop together.

3.2 Influencing factors of container ship mega-ships

First, the deployment of liner routes in the world has changed. Due to the increase in the proportion of super large container ships in the world liner routes, the super Panama ships have retreated to the second-tier routes in the global core routes, becoming the main ship type in the trans-Asia-Europe and trans-Atlantic routes. In the world route, the ship type selection is affected by the "iteration effect", which directly affects the main ship type in other routes.

Second, the global liner transport industry competition situation has a new situation. With the development of ship upsizing, major shipping companies have more and more large container ships. This means that the competition of shipping companies has increased the competition of large container ship operations on the basis of the original market share. From this, we can see that the competitive advantage of major shipping companies is concentrated on the advantage of scale economy, and the competitive field begins to shift to the competition of large container ship liner course. Therefore, shipping companies want to consolidate their market position only by opening large container liner routes and integrating shipping resources on a large scale[2].

Third, the global liner transport industry competition situation has a new situation. At present, large shipping companies at home and abroad have large container ships, and have been put into the operation of the world liner routes. This shows that the upsizing of container ships is changing the pattern of the world shipping industry, and the competition field of major shipping companies has also begun to change correspondingly, focusing on the competition of ultra-large container ships operating routes. Therefore, only by continuously investing in the construction of super large container ships and covering the first-class routes can major shipping enterprises enhance the competitiveness of the industry and consolidate their market position.

3.3 Factors driving the large-scale expansion of container ships

First, cost saving promotes the upsizing of container ships. Because container transportation can save packaging costs and reduce loading and unloading costs, it directly affects the economy of container ship transportation. With the upsizing of container ships, their construction costs are rising. But since the unit cost per container is not rising proportionally, it is falling. Moreover, ship operating costs do not increase proportionally with the increase of ship size. To a certain extent, economies of scale can be achieved through the operation of large ships, so as to achieve cost savings.

Second, the change of input cost promotes the upsizing of container ships. In the study of ship construction, it is found that the increase of ship construction tonnage is not proportional to the increase of ship total cost. This means that in the process of building large ships, the unit cost of their construction will be reduced. At the same time, with the increase of the size of the ship, the demand for its crew is not increased in the same proportion, which reduces the labor cost to a certain extent. Therefore, with the upsizing of container ships, the input cost of major shipping companies will be reduced, so that major shipping companies are more inclined to invest in large container ships.

Thirdly, shipping companies' operating strategies promote the upsizing of container ships. At present, the operation mode of major shipping enterprises in the world mainly focuses on: (1) the development of shipping companies has changed from a single mode to a joint mode. (2) Multimodal transport operators have become the main form of shipping development. (3) Diversified financing channels and models of shipping companies. The change of management strategy of shipping companies has further promoted the development of large container ships[3].

3.4 Factors constraining the development of large-scale container ships

First, ship speed limits the size of container ships. Through the operation of large container ships, major shipping enterprises reduce the number of ship investment in liner routes, save shipping capacity, open up new routes, and increase revenue. In order to meet the number of departures on fixed liner routes, shipping companies will solve this problem by increasing speed. However, the increase of ship speed will increase fuel consumption and increase the wear of ship main engine, which will reduce the economic benefits of ship companies to a certain extent. Therefore, large container ships need to set reasonable speed in the operation process, improve their fuel economy, and increase enterprise income.

Second, the constraints of voyage factors on the upsizing of container ships. In the study on the economy of ship upsizing, it is found that large-scale ships have obvious scale benefits in the process of long-distance transportation, on the contrary, large-scale container ships have not obvious scale economy advantages in offshore transportation. This is because, in the process of long-distance transportation of large container ships, the port docking time is relatively less than the sailing time, and its economies of scale are obvious. In the process of short-distance sea transportation, the proportion of docking time in port is larger than the sailing time, and the sailing efficiency of the ship is obviously reduced. Therefore, the sailing distance directly affects the economy of large container ships[4].

Thirdly, small and medium-sized container ships restrict the upsizing of container ships. Due to the rapid development of large-scale ships, many ports in

the world cannot meet the loading and unloading operations of super-large container ships. When very large containers are loaded and unloaded, they are often transported by small and medium-sized container ships. At the same time, large container ships cannot meet the transportation requirements due to a series of restrictions such as water depth conditions in the transportation of near oceans, coastal areas, inland rivers and inland lakes. Therefore, in this kind of route, small and medium-sized container ships also have a considerable number of units, which restricts the development of large container ships to a certain extent.

4. DEVELOPMENT STRATEGY OF CONTAINER SHIPS' LARGE SCALE

According to the theoretical research, it can be known that very large container ships have economies of scale. However, in the actual operation process, it is often affected by a series of factors such as the global economy and public emergencies. To some extent, this reduces the advantages of economies of scale of very large container ships. Therefore, reasonable suggestions are put forward according to economic factors of large container ships：

4.1 Strengthen investment in science and technology and reduce crew allocation

In the process of ship operation, manpower cost accounts for a large proportion compared with other operating costs of liner companies. Therefore, in the design and construction process of container ships, scientific and technological investment can be increased, and labor costs can be reduced by improving the degree of automation of ship driving and adopting new technologies such as unmanned engine rooms. In the process of container ship operation, advanced management experience can be used to simplify complex post Settings, reduce personnel staffing and reduce labor costs.

4.2 Standardize market management and improve core competitiveness

The development of large-scale ships promotes the development of container liner transport industry. Due to the high cost of super large container ships, the number of small and medium-sized shipping companies is relatively small, which has formed the phenomenon of shipping pooling to a certain extent. However, due to some differences in global shipping laws, shipping disputes occur in the process of shipping alliances. Therefore, in the development process of large-scale container ships, market supervision should be strengthened, combined transport laws and regulations should be formulated, shipping market management should be further standardized, and the core competitiveness of shipping enterprises should be improved.

4.3 Accelerate port construction and improve the level of comprehensive services

Ship operators and port operators play a decisive role in the development process of ship upsizing. Therefore, it is necessary to continuously increase port investment and construction in order to meet the requirements of large-scale development of container ships. Port investment operators can make port development strategies based on their own port environment and market demand through scientific prediction of the upsizing development of container ships. At the same time, the port infrastructure is reformed to meet the docking and operation of ultra-large container ships, improve the port collection and distribution capacity and operation efficiency, and meet the loading and unloading requirements of large container ships. Port operators should also continuously improve the level of comprehensive operation and management. Port operators should strengthen the communication and cooperation among maritime, customs, border defense and quarantine by optimizing the management of containerized freight stations and containerized cargoes, and improve the level of comprehensive services. With a more positive attitude, take the initiative to communicate and cooperate, and jointly promote the development of large-scale container ships.

5. SUMMARY

With the recovery of the shipping market, the upsizing of container ships has become the mainstream trend in the development of container ships, but in the development process, it is also affected by factors such as routes, voyages and port of call. Therefore, the study on the economy of container ship upsizing should trace back to the source, and formulate corresponding development strategies from the aspects of ship route selection, port of call, and speed economy, so as to better promote the development of container ship upsizing.

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Research on the Scene-Based Teaching Mode of Higher Vocational Colleges under the Background of Digitalization

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Abstract: In view of the positioning of higher vocational education, real enterprise problem scenarios are constructed based on the latest job requirements. The scenarios are not only introduced into teaching, but also serve as teaching content. Integrate the knowledge points and skills in traditional teaching into each progressive teaching scenario, use advanced technologies such as virtual simulation and digital twins to build scenarios, present knowledge in the scenario, train skills in the scenario, and verify the plan in the scenario , implement evaluation in the scenario. Teaching scenarios that are close to the real problems of the enterprise are implemented throughout the teaching process, forming a closed loop, and students are brought into the role to improve their ability to solve practical problems.

Keywords: Digitization; Vocational Education; Scene-based Teaching

1. INTRODUCTION

Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has always attached great importance to the role of informatization and digitalization in the development of education. Not only did he point out in his congratulatory letter to the International Conference on Educational Informatization that "building a networked, digital, personalized, and lifelong education system is the key to human beings" "Major Issues Facing Common Issues", and has repeatedly emphasized "cultivating new momentum through informatization" and "promoting new development." The Digital Twin Technology Application Working Committee systematically sorted out 15 "14th Five-Year Plan"series plans involving digital twin-related policies in various fields such as industrial production and construction engineering.

2. PRACTICAL REVIEW OF SCENARIO-BASED TEACHING MODEL

Scene is originally a professional term in the field of film and television. It refers to a picture composed of various character activities that occur within a specific time and space. It is a specific process that expresses the plot through character actions. Subsequently, the concept of scene was widely introduced into the business field, adhering to the understanding that what people often like is not the product itself, but the scene in which the product is located and the emotions immersed in the scene [1]. Scenario-based education mainly refers to a kind of thinking activity of "what to do, what to do, how to do it" actively stimulated by teachers and students under the interaction of environment and other factors in a specific time and space, and is based on This kind of thinking activity comes from the teaching activity process of independent exploration and coordinated communication, so as to realize the purpose of knowledge understanding and meaning construction [2].

2.1 Foreign practice

United States: The digital transformation of American higher education is at the forefront of higher education in the world. As early as around 2005, the academic circles began to discuss the transformation of university education; in the past 10 years, some universities have also introduced relevant reforms for the purpose of transformation, including eliminating the unfairness of higher education and breaking through the fragmented teaching model limited to majors wait. Some concepts and practices of the digital transformation of American education have great reference significance for our in-depth research on the innovative development of vocational education based on technological change.

Germany: Germany attaches great importance to digital construction throughout the entire process of vocational education. From revising training standards and training regulations, innovating the concept of education and teaching methods, to developing teaching programs and teacher training programs, and adjusting training content and training methods, all specific links are included. In the system engineering of digital transformation. This concept of digital transformation based on the whole process has guiding significance for our reform of vocational education curriculum teaching.

2.2 Domestic practice

Regarding vocational education, there are relatively few studies on scenario-based teaching in the context of digital twins. Most of them focus on the macro-level research and analysis of theory and mechanism. For example, Yuan Fan, Chen Weidong, etc. in "Scenario Empowerment: Scenario-based Design and Its Prospects for Educational Applications - Also

Discussing the Implementation Mechanism of Full Scenario Learning in the Metaverse Era" points out that scenarioization is constantly affecting and penetrating the field of education, and promoting rapid self-innovation and upgrading in the field of education. Scenario-based features include intelligent dynamics, joint co-creation, and emotional connectivity. From the three dimensions of resource immersion, humanistic service, and technology suitability, the research follows the principles of multi-resource adaptation, multi-modal mixing, and multi-scenario continuation, and develops scenarioization from the four steps of scenario insight, scenario manufacturing, scenario application, and scenario optimization. Design, enable the realization and application of full-scenario learning [3]. At the micro-operation level, Guo Xinyue also conducted exploratory research on the design of scenario-based learning activities, and constructed a learning scenario framework for vocational education integration of virtual and real activities in the "Research on the Design of Scenario-Based Learning Activities for the Integration of Virtual and Real Things in Vocational Education". Under the guidance of activity theory, a framework for vocational education's virtual-real integration scenario-based learning activities was constructed [4], and the design ideas for virtual-real integration scenario-based learning activities were proposed, which laid a solid foundation for our research on scenario-based teaching models.

To sum up, technological innovation in education and teaching has been implemented for many years. Although virtual simulation resources have been widely used in teaching and even changed the presentation form of teaching content, they have not been deeply integrated with teaching, touched the teaching structure, and have not been able to Fundamentally changing the teaching paradigm of "you speak and I listen" fails to truly correspond to the real work scenarios of enterprises. It even strengthens "indoctrination" and "control" due to the "abuse" of technology and resources, deviating from the original intention. For vocational education, "preaching" teaching cannot cultivate students' technical skills. "Coaching" teaching is the main teaching method, especially for equipment manufacturing majors. From abstract control models to specific system implementation, digital twins are more needed. Technology empowers teaching scenarios. Therefore, it is necessary to study and analyze the integration path of digital twin technology and scenario-based teaching, and explore new models of scenario-based teaching innovation and reform, which will not only help accelerate technological innovation in teaching, but also promote the smooth digital transformation and high-quality development of vocational education.

3. EXPLORATION OF THE APPLICATION OF SCENE-BASED TEACHING MODE IN PRACTICE

With the rapid development of digital technology, how to integrate the latest information technology into teaching, optimize teaching, and promote the all-round development of people. In order to highlight the concept of intelligent technology serving teaching, learning, and human development, respecting the law of human growth and the logic of teaching, based on the research ideas of building teaching scenarios with digital assistance, and facing the teaching practice of equipment manufacturing majors, from the constructivist scenario Explore three aspects: the construction of theoretical foundations, the integration of ideological and political scenarios and teaching scenarios, and the application of enterprise scenarios for process reproduction.

3.1 Theoretical basis of constructivism's scene construction

The constructivist theory was first proposed by the Swiss psychologist Piaget. When studying children's cognitive development, he proposed that there are two forms of interaction between children and the external environment: "assimilation" and "adaptation". "Assimilation" refers to the child's interaction with the external environment. The cognitive subject integrates the new information received into the existing cognitive structure, and "adaptation" refers to reconstructing the original cognitive structure and integrating it with the new information. Piaget's view emphasizes the subjective initiative of learners in constructing their own knowledge structures. Learners do not passively receive knowledge, but complete self-construction in specific environments [5].

The constructivist teaching model emphasizes student-centeredness and regards students as cognitive subjects and active constructors of knowledge meaning. Teachers only help and promote students' meaning construction. There are various teaching methods of constructivism, but their commonality is that they all include situation creation and collaborative learning in the teaching process, and on this basis, the learners themselves ultimately realize the meaning construction of the knowledge they have learned [6]. Based on this theory, teachers should adopt a student-centered teaching model in the teaching process, completely abandon the teacher-centered teaching model that emphasizes knowledge transfer, and treats students as objects of knowledge instillation, so as to increase students' learning initiative and let them Students actively construct knowledge while participating in teaching activities [7].

3.2 Integration of education scene and teaching scene

At present, there is a common phenomenon among higher vocational students that they would rather work in an office with a low income than work in a workshop with a high income. In order to solve the problems of impetuousness and lack of respect for technical skills, we propose the practice of "unity of heart and action" to cultivate ingenuity and sharpen

craftsmanship. Education concept. Endow "heart" with four elements of character, ambition, knowledge, and spirit; endow "action" with four connotations of words and deeds, skills, duty performance, and innovation. Carry out craftsman spirit education before training, labor awareness throughout training, and professional quality evaluation after training. Inherit the red gene, fulfill the original mission, and root the spirit of model workers, labor, and craftsman in our hearts. Based on literacy goals and knowledge and skill goals, build a teaching scenario that integrates educational education and skill training. For example, based on actual corporate cases, introduce relevant educational elements, implement experiential teaching, and acquire skills throughout the entire project implementation process. , In the process of skill improvement, I have a sense of ideology and politics, pursue thoughtfulness and good deeds, work hard, take morality as the foundation, and cultivate both morality and skill.

3.3 Teaching application of process reproduction enterprise scenarios

Vocational education is a type of education that combines work and learning. In order to cultivate technical and skilled talents who meet the needs of the job, the dual collaboration between schools and enterprises constructs a "production chain" for practical training. Utilize technologies such as virtual reality, digital twins, and human-computer interaction to construct a production environment of a single skill training room and create a production "ring" for unit device skill training. Introduce industry representative production lines from Weichai Power and Goertek Co., Ltd., dynamically update, continuously iterate, and jointly build and share. Virtually simulate the production process of crankcase manufacturing and consumer electronics products, construct a production "chain" combining virtual and real, strengthen the real production "chain" of enterprise production lines with on-the-job training, and integrate skill master studios into the production chain. Chain training, interlocking with each other, looks at the individual effectiveness from the overall effect, ensuring the systematic nature of skill training. Technical materials, teaching resources, and R&D projects are updated at the same time, integrating scientific research results to create a high-efficiency practical teaching platform.

4. SUMMARY

The World Economic Forum proposed the "Education 4.0" global framework, pointing out that the traditional teaching method and human-computer interaction based on digital screens can no longer meet the needs of future education. Studying the new scenario-based teaching model under the background of digitalization is one of the practical and effective measures to implement the national education digitalization strategy and accelerate the digital transformation of education. It provides conceptual guidance and strategic coordination for technological innovation teaching, and provides guidance for innovative teaching activities in equipment manufacturing majors. Implementation provides direction and practice. Provide action basis for the continuous advancement of technological innovation teaching, promote the continuous integration of information technology into teaching, and change the teaching ecology. To promote the all-round innovation and digital transformation of teaching, we must not only give full play to the advantages of top-level design in overall planning, overall coordination, etc., and create a long-term development vision for digital innovative teaching; we must also pay attention to grassroots exploration in developing habits of intelligent technology application, It plays a practical role in generating teaching culture and promoting the transformation of teaching methods, and strives to truly achieve comprehensive innovation and digital transformation of teaching in the positive interaction process between top-level design and grass-roots exploration.

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Analysis of Joint Debt Assumption in Private Loan Disputes Case

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Abstract: The assumption of joint debt is not significant compared to other issues involved in private lending cases, but it is still very important. This paper analyzes one typical case and demonstrates the establishment and effectiveness of loan relationships, as well as the joint debt obligation in private lending relationships, in order to promote empirical research and improve the legal system for joint debt assumption.
Keyword: Joint Debt Assumption; Private Loan Disputes; Loan Relationships

1. INTRODUCTION

Based on whether the original debtor can continue to perform, it is divided into two types: exempt liability and joint liability. The joint of debt bearing, also known as debt joining, refers to the addition of new personnel in the original debt relationship, known as the new debtor. Although new debtors have joined, the original relationship between the two parties will not change. Article 551 of the Civil Code of the People's Republic of China breaks through the standard for dividing creditor's rights and liabilities stipulated in traditional civil codes, achieving the purpose of transferring creditor's rights and liabilities [1]. The assumption of joint debts has the following three main characteristics. First, based on the existing debt situation, the debtor or a third party shall directly notify the creditor without the consent of the creditor; Second, after participating in the debt relationship, a third party may conflict with the creditor for reasons that conflict with the creditor, but for reasons that conflict with the debtor themselves, they cannot conflict with the creditor for reasons that conflict with them; Third. after the establishment of joint debts, due to the full repayment of the debt by the original debtor or a third party, and the debt being repaid by the third party, the debt is eliminated. When the third party repays the debt, the debt creates a demand for repayment relationship between the third party and the debtor[2].

2. CASE FACTS AND LITIGATION

The plaintiff A and defendant B are friends, the defendant C is a company established by the defendant B as a legal person, and the defendant D and defendant B have a marital relationship. Defendant B borrowed a loan from the plaintiff due to financial difficulties. Plaintiff A borrowed 33.908 million yuan from defendant B from 2013 to 2016, with an agreed monthly interest rate of 2% and monthly interest payments. Defendant C issued a promissory note, IOU(receipt for a loan), or statement of account to plaintiff A, while defendant C issued a promissory note with financial seal to the plaintiff. On October 6, 2016, after reconciliation, both parties signed an "agreement" to repay the principal of 15.66 million yuan before October 10, 2019, at an annual rate of 15%; The principal of 3.55 million yuan was repaid before October 10, 2017, with an annual interest rate of 24%; The principal of 3 million yuan was repaid on October 10, 2017 at an annual interest rate of 18%. The interest on all three payments was paid before the 5th of each month, with a 50% increase in the interest rate that violated the agreement. The plaintiff who owed the interest twice has the right to demand early repayment of all the loans and settlement of the interest. On March 20, 2018, the plaintiff and defendant verified the principal and interest, and the defendant issued a statement of account to the plaintiff again, confirming the principal and interest again, and stating that they would repay in a timely manner. During this period, the plaintiff repeatedly urged the defendant to demand the principal and interest, but the defendant has evaded various reasons and has not been able to repay it. Defendants B and C, as co borrowers, issued a promissory note to the plaintiff, and the plaintiff actually provided the loan. The two defendants should repay the principal and interest of the loan. Defendants B and D are husband and wife, and D should bear joint repayment responsibility.

Claim A: 1. Order Defendants B, C, and D to jointly repay and restore the principal amount of Claim A of 19430000 yuan and outstanding interest of 2093467 yuan (as of November 30, 2016); 2. Order Defendants B, C, and D to calculate interest at an annual interest rate of 22.5% based on the principal of 14.14 million yuan from December 1, 2016 to the actual date of repayment of the principal; The interest calculated from December 1, 2016 to the actual repayment date of the principal, based on an annual interest rate of 24% based on the principal of 2.81 million yuan; The interest calculated from December 1, 2016 to the actual repayment date of the principal at an annual interest rate of 24% based on the principal of 2.48 million yuan (temporarily calculated as 10311715 yuan as of March 15, 2019); 3. Order defendants B, C, and D to bear the case acceptance fee, preservation fee, and preservation liability insurance premium.

3. DEBT RELATIONSHIP IDENTIFICATION

(1)Regarding the assumption of repayment responsibility. A claims that C, B, and D should all

bear repayment responsibility for the debt in this case, on the grounds that B and C are joint borrowers and the debt involved occurred during the period of B and D's marital relationship. Regarding the determination of the borrowing entity, this court believes that from the perspective of lending and receiving the funds, except for two payments entrusted by Liu Jianhui to outsiders, all the disputed funds are paid by A himself, and the payee is B and non defendant E. C issues a promissory note, with the legal representative B and the payee E signing for confirmation. Especially on the promissory note with a loan amount of 3 million yuan on April 8, 2014, it was indicated that B is the guarantor, indicating that A and B clearly recognize the borrower as C. At the same time, from the perspective of payment repayment, 52 repayments have been made through remittance. The remitters are B, non defendant E, non defendant F, non defendant G, etc. It is not only B who repays or entrusts others to repay. Although A and B confirmed the amount owed by agreement on October 6, 2016, there was no official seal of C added. B is the legal representative of C, E is the supervisor of the company, and the recorded conversation between A and E shows that E's collection and repayment are not related to fulfilling their duties. In summary, C is the borrower of the disputed funds, while B's collection, repayment, signing of agreements, and issuance of IOUs all belong to official behavior. A's claim that B is a co borrower is not supported due to insufficient evidence. However, C is a one person company, and B cannot provide evidence to prove that their personal property is not mixed with C. In fact, B has made multiple large payments and repayments on behalf of C, and the two assets are mixed. Therefore, B shall bear joint and several liability for the repayment of C's loan debts.

C is the borrower of the disputed funds, and the loan debt belongs to the company debt, not B's personal debt. D has not participated in the transaction of the loan funds, and there is no confusion between A and D's family property and C's property. A's request to order Wei Jing to bear repayment responsibility for the disputed loan debt is insufficient evidence, and this court does not support it.

4. CONCLUSION

In summary, the author believes that A's litigation claim is partially established. According to Articles 205, 206, 207 of the Contract Law of the People's Republic of China, Article 29, Paragraph 2, Item 2 of the Provisions of the Supreme People's Court on Several Issues Concerning the Application of Law in the Trial of Private Loan Cases, Article 63 of the Public Administration of Justice of the People's Republic of China, and Article 64 of the Civil Procedure Law of the People's Republic of China[3-5], the following judgments shall be made:

(1) Defendant C shall repay and restore the principal and interest of defendant A's loan within ten days from the effective date of this judgment;

(2) Defendant B is jointly and severally liable for C's loan debts.

(3) Reject plaintiff A's other claims.

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The Construction of Digital Teaching Curriculum Resources Based on the Integration of Production and Education

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Abstract: At present, the state vigorously develops higher vocational education and promotes the deep integration of production and education. Introducing digital technology into the teaching process and using virtual digital twin technology to build a training platform can enrich teaching materials and enrich training methods, which is of great significance for optimizing teaching resources and improving students ' technical skills.This paper takes the construction of digital curriculum resources of equipment intelligent manufacturing specialty group as an example, expounds the practice process of digital teaching resources construction, and makes a useful exploration for promoting the deep integration of production and education.

Keywords: Integration of Industry and Education; Digital Curriculum Resources; Virtual Training.

1. BACKGROUND

As the cradle of professional talents training in China, higher vocational colleges undertake the important task of cultivating high-quality skilled talents. However, there are still the following problems in the integration of industry and education in vocational education .

1.1 Higher vocational college personnel training does not match the needs of industry and enterprises

In terms of training mode, curriculum setting and teaching process, higher vocational colleges are separated from the actual needs of the enterprise industry and lack pertinence, practicality and professional characteristics[1].

1.2 The effective mode of industry-education integration and school-enterprise cooperation has not yet been formed

As a production line, the enterprise has rich production practice resources, but the school-enterprise cooperation lacks effective cooperation mode and mechanism, the bridge construction of school-enterprise cooperation is not smooth enough, and the training teaching is difficult to be limited to the site and time.

Intelligent Manufacturing College constantly explores and promotes the deep integration of production and education, builds an effective way to effectively transform the excellent resources of enterprises into teaching resources, uses digital technology to create virtual practice scenes, gives full play to the advantages of industry and higher vocational colleges, vigorously promotes the construction of digital teaching resources, constantly improves the new methods of talent training in higher vocational colleges, and comprehensively improves the quality of talent training in higher vocational colleges[2].

2. MAIN PRACTICES

At present, the development of intelligent manufacturing industry is changing with each passing day. Traditional teaching classroom knowledge often lags behind actual production, and teaching materials are abstract and idealized. In order to better integrate new technologies, new processes and new norms into theoretical knowledge, let digital technology serve practical teaching, enrich teaching resources, improve project-oriented teaching content, and better promote the combination of enterprise production and teaching, the School of Intelligent Manufacturing has developed and constructed a series of digital teaching resources to provide a strong practical basis and resource guarantee for the construction of curriculum content.

2.1 Strengthening the awareness of digital resources construction

The construction of digital resources in the ' Internet + ' era is an important part of the construction of digital campus. The demonstration virtual simulation of vocational education is an important digital transformation and upgrading measure in the field of vocational education. As a powerful supplement to the conventional teaching in colleges and universities, the construction of demonstrative virtual simulation of vocational education plays an important role in the development of vocational education. It effectively solves the theoretical and practical teaching problems of high investment, high loss, high risk, difficult implementation, difficult observation and difficult reproduction. Higher vocational education requires more practical teaching links. Relatively speaking, there are more problems of " three highs and three difficulties, " especially in engineering majors. There are more high-risk environments in practical training. The construction of demonstrative virtual simulation of vocational education is imperative. The leaders of each professional group should take the lead in learning the policies and knowledge related to the construction of digital resources of the professional

group teachers ' team, and convey this policy and knowledge to the teachers in the professional group, so as to improve the teachers ' emphasis on the construction of digital resources of the professional group teachers ' team. Through the virtual simulation technology such as ' AR / VR / MR ', we can help the virtual simulation construction of vocational education training resources, realize the innovation of teaching content, encourage students to learn independently, and improve students ' practical application ability.

2.2 Develop and build enterprise project library, create 'project-oriented ' curriculum resources

At present, the development of intelligent manufacturing industry is changing with each passing day. Traditional teaching classroom knowledge often lags behind actual production, and teaching materials are abstract and idealized. In order to better integrate new technologies, new processes and new norms into teaching, enrich teaching resources, improve project-oriented teaching content, and better promote the combination of enterprise production and teaching, the intelligent manufacturing academy sent work classes to the enterprise. In-depth, understand the current situation of industry production, organize research and discussion with enterprises for many times, extract the most advanced enterprise resources closely related to the improvement of students ' technical skills, develop and construct 100 teaching projects from enterprise production, and provide a strong practical basis and resource guarantee for the construction of curriculum content.Through research and discussion with enterprises, we have extracted the most advanced and feasible enterprise resources in the industry, and transformed them into a national teaching resource library for electrical automation technology. The curriculum resources have reached 53,593 and 13 structured courses ; it has completed 2 sub-projects of the national professional teaching resource database, 3 national excellent courses and 20 provincial excellent courses. It has improved the project-oriented teaching content and provided a strong practical basis and resource guarantee for the construction of curriculum content.

2.3 Virtual simulation builds a bridge to create ' cloud training ' resources

Due to many problems such as site and safety, it is difficult for students to enter the enterprise to visit, train and practice[3]. The last kilometer, which is difficult to break through, greatly reduces the effect of students ' practical training. In order to cope with the difficulty of students ' participation in enterprise training, the School of Intelligent Manufacturing and Rheincost have created the ' cloud training ' resources based on PS simulation software with the help of virtual simulation technology. The real case of the enterprise is created in the virtual simulation software to create a 1 : 1 digital twin resource, so that students can experience the real enterprise training scene through cloud access. The simulation software can be used to disassemble and layout the automatic production line. The robot and PLC are programmed and virtual online debugging is carried out. Through the simulation of virtual simulation software, the accessibility of the robot is verified, and the safety detection of collision is carried out. The verified program in the digital twin simulation software can be directly output and used in real equipment. Through the application of automatic production line through simulation software, the establishment of digital resources, students can complete the training at any time and any place, broaden the flexibility and adaptability of training.

The construction goal is to build a virtual simulation digital resource suitable for the practice of integration of informatization and industrialization, the decomposition of production process and the control of intelligent equipment in the field of intelligent manufacturing, so as to meet the students ' learning needs in the aspects of theoretical principle, function, installation, debugging, operation and maintenance in the training project. Digital resources should not only support the operation of each production equipment in the physical system in a completely real way to achieve the full real production equipment operation effect of internal and external linkage, but also provide a semi-physical simulation operation environment in the way of virtual and real combination and human-computer interaction. At the same time, it should also meet the training needs of equipment action decomposition, working principle decomposition and production process decomposition in the virtual environment, and use the breakthrough teaching method to establish a student-centered target teaching mode in the digital resources. It can display the appearance layout, system structure, operation status, fault maintenance operation of intelligent manufacturing equipment in the way of three-dimensional roaming, virtual-actual interaction, MR virtual-actual combination experience, etc., and truly realize the five functions of ' learning, practice, examination, application and research ', so as to cultivate high-tech skilled talents in the field of intelligent manufacturing[4].

2.4 Create double-qualified ' teacher resources

New technologies, new processes and new specifications are constantly emerging in the intelligent manufacturing industry. In order to further introduce fresh ' source water ' into teaching and improve the level of teachers and students ' mastery of new skills, cooperative enterprises follow up new technologies. At the same time, the school teachers are trained in time. The cooperative enterprise Rheinkost provides the teachers of the intelligent manufacturing college with advanced technical training on digital twin technology, MCD technology, PS simulation technology, visual recognition technology and so on. The training has reached more than 30 times, and the proportion of professional teachers participating in the

training has reached more than 85 %. At the same time, the School of Intelligent Manufacturing has appointed professional teachers to carry out practical work on the site of enterprises such as Rhine Coast, Xinhua Medical, and Neustadt.Enterprises provide venues and equipment for students to practice and train. The College has established an expert committee to regularly carry out professional and technical exchanges and discussions with enterprises. The enterprise assigns staff to guide the interns and assist the college to carry out the daily management of the students. The college invites the relevant leaders of the enterprise to participate in the construction of talent training. The enterprise carries out professional and post work guidance for interns and students. College teachers and enterprise tutors participate in the whole process of student training. Through teacher training and students ' dual training, the advanced nature of the technology of teachers and students in the college is guaranteed.

3. CONCLUSION

In the course construction, virtual simulation technology is used, enterprise resources are fully introduced, project-oriented teaching design is carried out, and digital teaching resources are established. It can effectively link production practice with professional knowledge, provide students with real-time, interactive and multi-dimensional learning environment, and intuitively show all kinds of complex and abstract knowledge points. Improve students ' understanding of abstract knowledge, so that students can enjoy the learning fun brought by digital

teaching and no longer be limited by any time and place to carry out learning and practical training. Promote personalized learning and self-learning, and achieve simultaneous improvement of knowledge and skills.At the same time, promote teachers to understand the application of new technology, new technology and new skills, update the structure of professional ability, and practice teaching ability.

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Research on the Construction Path of Urban Industry Education Joint Venture

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Abstract: Starting from the implementation path of the municipal industry education consortium, this article takes the content, methods, and guarantee mechanism of the construction of the industry education consortium in Zibo National High tech Industrial Development Zone as an example to discuss how vocational education is deeply bound with industry progress, industrial transformation, and regional development. It studies the innovative and positive interaction mechanism of complementary advantages of government, enterprises, and universities, and solves the problem of low matching between the supply side of talent cultivation and the demand side of the industry Practical issues such as "integration of industry and education without integration" and "lack of deep and practical cooperation between schools and enterprises".

Keywords: Municipal Industry Education Consortium; Industry Education Integration; Mechanism

1. INTRODUCTION

In December 2022, the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "Opinions on Deepening the Reform of Modern Vocational Education System Construction" (hereinafter referred to as the "Opinions"), proposing the strategic task of "provincial governments, based on industrial parks, to create a municipal industry education consortium that combines talent cultivation, innovation and entrepreneurship, and promotes high-quality development of industrial economy"[1]. It has been clarified that local governments should take the lead in overall planning and coordination, rely on industrial parks, gather various resource elements, promote diversified participation in vocational education reform, and continuously enhance the alignment between talent cultivation and industrial development needs. On April 20, 2023, the General Office of the Ministry of Education issued the "Notice on Carrying out the Construction of Municipal Industry Education Joint Ventures" (hereinafter referred to as the "Notice"), requiring the initiation of the creation of municipal industry education joint ventures. The goal is to build around 50 municipal industry education consortiums by the end of 2023, another 50 by the end of 2024, and a total of around 150 by 2025. Shortly after the release of the "Notice", the "Municipal Industry Education Consortium" became a hot topic in the field of vocational education[2]. Within more than a month, multiple cities have successively established industry education consortia, and industry education consortia in Guangdong, Zhejiang, Shandong and other places have been launched.

The industry education consortium is a significant change in the governance system, governance methods, and governance effectiveness of industry education integration. It is an important strategic measure to break through the pain points, bottlenecks, and difficulties in the integration of industry education and school enterprise cooperation in vocational colleges, and to systematically promote the integration of education, technology, and talent development towards higher levels[3].

2. THE MAIN PROBLEMS CURRENTLY FACED BY THE MUNICIPAL INDUSTRY EDUCATION CONSORTIUM

On May 17, 2023, the Education Department of Shaanxi Province explicitly planned to build a number of municipal industry education consortiums. Xi'an Yanliang National Aviation High tech Industrial Base and Xi'an Aviation Vocational and Technical College took the lead in launching various measures, such as jointly building industrial colleges with leading enterprises and creating technical service platforms, to comprehensively promote the integration of industry education. Our province has also taken the "Notice" as a guide and conducted joint research with five departments[4], proposing the overall requirements, construction mechanism, key tasks, and guarantee measures of the consortium, and listing the "Construction Indicators of Municipal Industry Education Joint Ventures". On May 2nd, three municipal industry and education consortiums, namely the Weifang High tech Industrial Development Zone Industry and Education Consortium, the Weifang Binhai Economic and Technological Development Zone Industry and Education Consortium, and the Weifang National Agricultural Open Development Comprehensive Experimental Zone Industry and Education Consortium, were established one after another. The universities, enterprises, and research institutes within the consortium will abide by the consortium's charter, actively integrate resources, strengthen cooperation and cooperation, and discuss training plans and form teaching teams based on the needs of industrial development Sharing teaching resources, continuously improving the quality and

adaptability of cultivating technical and skilled talents, boldly exploring and innovating in the construction of industry education integration system, mechanism design, cooperation mode, and benefit distribution, bridging the "last mile" of talent supply and demand, and forming a new pattern of industry education integration development where the government, enterprises, schools, and industry associations each assume their respective responsibilities and work together; On May 15th, Binzhou City established the National High end Aluminum Intelligent Manufacturing Industry Education Integration Community, the Yellow River Delta Bioeconomy Industry Education Consortium, and the Binzhou City Industry Education Consortium, aiming to continuously promote the government, enterprises, schools, and society to "grasp the finger and become the fist", accelerate the improvement of the "industry, academia, research, training, and innovation" system, and achieve win-win results in multiple aspects as soon as possible; On May 18th[5], Shandong Vocational and Technical College of Commerce signed a contract with the Jinan Central Business District to establish the Jinan City "Science and Technology Innovation Finance" Industry Education Consortium; On May 29th, Zibo City established the Zibo National High tech Industrial Development Zone Industry and Education Consortium, building a high-level platform for cooperation and exchange among "government, industry, school, and enterprise", exploring innovative high-skilled talent training and service industry models, building a new ecosystem of "promoting production through education, assisting teaching through production, integrating industry and education, and cooperating with industry and education", and creating a new model and benchmark for national industry and education integration.

At present, although municipal industry education consortia have been established both inside and outside the province, with clear goals for the construction of the consortia, the implementation path is still unclear. The municipal industry education consortium involves multiple stakeholders, and there are multiple different types of universities in the same region, with different participants. Due to different affiliations and funding channels, most units are self-contained and need to achieve the same frequency resonance between multiple entities such as industrial parks, schools, research institutions, enterprises, and local governments. Without a comprehensive implementation path, the municipal industry education consortium may encounter problems such as "unity but non conformity" and "unity but non integration" to some extent, which may not achieve the expected goals of consortium construction.

3. IMPROVE TOP-LEVEL DESIGN AND ESTABLISH A WIN-WIN COOPERATION ECOSYSTEM AMONG MULTIPLE PARTIES

The municipal industry education consortium will fully leverage the role of government coordination, industry aggregation, enterprise traction, and schools as the main body. Based on the industrial park, it will also have the functions of talent cultivation, innovation and entrepreneurship, and promoting high-quality development of the industrial economy.

The main tasks of the municipal industry education consortium are divided into mechanism construction, talent cultivation, and promoting deep integration of industry education. It is necessary to improve the top-level design, and systematically plan from multiple aspects such as management mode, information communication, and benefit sharing. By improving the mechanism, the "two skin" problem of industry education integration can be overcome, and a multi party win-win community can be established.

3.1 Establish a multi-party management organization

To build a municipal industry education consortium, it is necessary to promote the real participation of multiple entities such as industry enterprises in the management of vocational colleges and participate in major decision-making and deployment. Establish a scientifically reasonable organizational structure and effective physical operation of the school council, improve the school council charter, gather social resources, assist the school in running schools, and promote the school to serve the local, industrial, and community. At the professional level, establish a professional group construction council composed of business supervisors from secondary colleges, industry experts, representatives of cooperative enterprises, professional leaders, and backbone teachers to jointly promote professional construction.

From a holistic perspective, the municipal industry education consortium has achieved the integration of advantages of multiple entities, including "government+schools+enterprises+research institutes". It is a high-level form of industry education integration with holographic, cross-border, and symbiotic characteristics. Led by the government, integrating interests and demands, seeking value balance, and promoting diversified cooperation, co construction, and co governance. In the process of constructing and operating a municipal industry education consortium, the government should consider the construction of the consortium entity itself and the integration of industry education as important content of public value creation, guide industries, enterprises, schools, and relevant entities to jointly deepen the key areas of industry education integration, and create public value through establishing mechanisms, improving policies, leveraging their respective advantages, and promoting integration innovation[6].

In the construction and operation of the municipal industry education consortium, the government, enterprises, schools, and other equal participants are all creators of public values. All entities should establish equal cooperation, communication, and

dialogue mechanisms around public interests and collective preferences, and work together to build an industry education consortium, forming a value integration mechanism.

3.2 Establish a smooth information communication mechanism

School enterprise cooperation has a cross-border nature, and the main objectives of both schools and enterprises are different. In the case of information asymmetry, cooperation costs are high, effectiveness is low, and it is difficult to achieve win-win results. The consortium should establish and improve the communication mechanism and deliberation system of the council, fully leverage the intermediary role of government regulatory departments and industry associations, build a digital open platform, and timely collect and release information on school enterprise cooperation.

3.3 Establish a benefit sharing mechhanism with equal rights and responsibilities

There are interest oriented conflicts between schools and enterprises, and it is necessary to establish interest sharing mechanisms such as resource integration, achievement sharing, and value exchange to stimulate the motivation of industry enterprises to participate in school enterprise cooperation. Explore the reform of the mixed ownership education model in vocational colleges, try to establish a management and operation mechanism that integrates different forms of capital and effectively combines social resources, carry out more flexible independent management, and ensure equal rights and responsibilities of industry enterprises and the sharing of achievements.

Promote innovation in resource utilization models and form an integrated and shared ecological pattern of resources in municipal industry education consortia. The municipal industry education consortium takes "city" as the region, and the uneven distribution of educational and industrial resources within the city will inevitably affect the integrated and integrated development of the consortium. Promoting innovation in resource utilization models is one of the solutions. We should fully utilize the overall coordination function of the municipal government, leverage the resource integration advantages of the municipal industrial parks, and jointly build a smart sharing platform for industry education integration resources led by the government and participated by multiple parties. This will promote the strong alliance and complementary advantages of various universities and industry enterprises in the region, fully leverage the spatial cluster effect, and establish a dynamic resource allocation mechanism to more effectively promote the effective creation of regional public value.

4. ESTABLISH A LONG-TERM GUARANTEE MECHANISM OF "THREE COMPREHENSIONS AND THREE INTEGRATIONS, FIVE VERTICAL AND FIVE HORIZONTAL"

Each unit within the consortium should leverage the complementary advantages of industry education integration, based on social needs, regional development, and people's well-being, expand the scope of supply, improve the quality of supply, and establish a regional industry education joint service community.

4.1 Expanding the breadth and depth of social training
Relying on the advantages of the school's major, faculty, and scientific research, we will establish a characteristic industry training college to provide various forms of social training for in-service employees, community residents, migrant workers, urban and rural unemployed individuals, and rural practical talents. Fully leverage the advantages of resource integration, strengthen communication and cooperation with industry enterprises in the construction of high skilled talent training bases, skill appraisal stations, and community skill training service centers, and create a three-dimensional training base that integrates skill training, teacher training, course development, project cultivation, and quality management. Stabilize the scale of continuing education for higher education, expand community education and lifelong learning services.

4.2 Promoting regional cultural inheritance and innovation

Vocational colleges should engage in deep cooperation with local traditional craft industry enterprises, jointly develop talent cultivation plans, establish "intangible cultural heritage" master studios on campus, learn, inherit, and innovate traditional crafts and folk skills, and assist in the development and growth of traditional cultural industries. In addition, utilizing the market sensitivity and professionalism of industry enterprises, collaborating with cultural communication enterprises, innovating regional cultural service methods, creating public cultural products, and stimulating public participation enthusiasm.

4.3 Serving rural revitalization and promoting common prosperity

Vocational colleges should leverage their educational resource advantages such as talent, technology, and management, and align with the market resource advantages of industry enterprises such as capital, equipment, and information. Through diversified cooperation measures such as talent cultivation, scientific and technological services, industrial development, cultural cultivation, ecological protection, and base construction, they should promote the dual revitalization of rural material and spiritual civilization.

5. CONCLUSION

Through research and practice on the implementation path of municipal industry education consortia, we aim to address the issue of low matching between the supply side of talent cultivation and the industry demand side, promote the formation of a collaborative innovation mechanism for value creation, benefit

sharing, and risk sharing in consortia, and promote the deep integration of vocational education with industry progress, industrial transformation, and regional development. Optimize and restructure the professional chain, talent chain, and innovation chain, create a regional industry education joint education community, a regional industry education joint research and development community, and a regional industry education joint service community, making the industry education consortium a living pool for talent cultivation, an incubator for innovation and entrepreneurship, and an accelerator for high-quality industrial and economic development.

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The Analysis of Key Points in Communication Transmission Line Design and Construction Technology

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Abstract: The safety and reliability of communication transmission lines is the prerequisite for ensuring the stable operation of communication equipment. In order to ensure the long-term safety and reliability of the transmission line, it is necessary to focus on the design and construction of the communication transmission line, eliminate all hidden dangers in the bud, and try to avoid failures in any link. This article focuses on the design of communication transmission line and the key points of construction technology operation, and summarizes the main problems that should be paid attention to in design and construction, hoping to provide some reference for communication engineers.

Keywords: Communication Transmission Line; Design; Construction Technology

The communication transmission line is the channel to ensure the transmission of information. At present, the long-distance trunk line mainly uses optical cables with a large number of cores, and there are also wireless lines such as satellites and microwaves. Inter-provincial and intra-provincial long-distance are also dominated by optical cables, as well as microwave and satellite circuits. This is mainly because optical fibers have good anti-interference ability, confidentiality and stability. In order to reduce the construction cost, the trunk optical cables are mainly laid overhead with open wires at present. Engineering designers must design the direction of pole roads and draw construction drawings in strict accordance with the specifications[1].Project construction personnel must strictly control the construction quality to ensure the quality of project construction.

1. THE KEY POINTS OF COMMUNICATION TRANSMISSION LINE DESIGN

The design work of the communication transmission line has a relatively prominent impact on the subsequent construction, and also has a relatively large impact on the entire communication transmission line. Therefore, the engineering design must be able to ensure the overall communication quality of the communication network, advanced technology, economical and reasonable, safe and reliable , the main points are as follows.

1.1 Clarify the design requirements for communication transmission lines

Before carrying out the engineering design of communication lines, the construction unit should first prepare the design task book according to the long-term plan of telecommunication development and combine the requirements of technology and economy, and carry out the design work after the approval of the higher authority. The design brief should point out the principles that must be considered in the design, the scale, content, nature and significance of the project; the special requirements for the design; construction investment, time and the possibility of "recycling old" and so on. The design must be divided into stages according to specific conditions such as project scale and technical complexity, and must be carried out in strict accordance with the design procedures[2]. At present, the design work of construction projects is generally carried out in two stages, namely "preliminary design" and "construction drawing design". Small-scale and technically simple projects can be carried out in one stage. For large-scale and technically complex projects, the main route of the line, the address of the station, and the communication hub building in a large city can be adjusted according to the designation of the competent department. For major technical requirements such as schemes and safety measures, etc., the scheme survey shall be carried out first, and the scheme survey report shall be presented, and then the preliminary design survey work shall be carried out on this basis.

For the design of communication transmission lines, focusing on clarifying the corresponding design requirements can be said to be the basic prerequisite and an important guarantee for the reliable operation of communication transmission lines, which can form a certain standard and constraint on the design work. Therefore, designers must first master the specific design specifications and standards of communication transmission lines to ensure that the subsequent specific design work in all aspects can be carried out under the requirements of these standards to avoid any violations. In addition, it is also necessary to analyze the characteristics and requirements of the actual engineering project of the communication transmission line, so that it can show a relatively ideal pertinence and adaptability in the subsequent specific design work, and avoid some problems caused by processing completely in accordance with specific

specifications[3].

1.2 Do a good job in the measurement and design of the pole road

For the design of communication transmission lines, the accurate measurement and effective design of poles are also important aspects, which are directly related to the operation effect of communication transmission lines, and need to be reasonably configured in combination with the basic scope and specific needs. In a narrow area, when the proposed overhead optical cable is laid in parallel with the existing overhead line, if the distance cannot meet the requirements, the pole road can be shared or other methods can be used to lay the optical cable line, and the spacing requirements can be met. The field pole road along the traffic line should be 15m~50m away from the outside of the road boundary. The road along the railway pole should be outside the red line of the road boundary. The pole road is at the curve of the railway or road, and it can be properly avoided when encountering obstacles, but the distance from the road should not exceed 200m. In the urban area, the pole road should be erected on the sidewalk of the road or at a position agreed with the urban construction department to avoid crossing houses and other buildings. Communication lines should not be on the same side as power lines. Of course, the design of the pole road also needs to consider the influence of climate and environment to fully ensure the stable operation in the future[4].

1.3 Do a good job in the design of optical cable routing

The following issues should be paid attention to in the routing and selection of optical cables: The routing of optical cable lines should be based on the existing terrain, ground features, building facilities and established construction plans, and the influence of development plans of relevant departments should be considered. The routing of optical cable lines should generally avoid trunk railways and should not be close to major military targets. The long-distance optical cable line should be along the road or the main road where motor vehicles can pass, but should avoid road land, roadside facilities, green belts and planned diversion areas, and the distance from the road should not be less than 50 meters. The routing of optical cable lines should be selected in areas with stable geological conditions and flat terrain. When the optical cable line crosses the river, it should be selected in a place that meets the requirements for laying underwater optical cables, and should take into account the large routing direction, and should not deviate too far. Optical cable lines should not pass through large industrial bases and mining areas. If unavoidable, protective measures must be taken. Optical cable lines should not pass through cities and towns, and try to pass through villages as little as possible. Optical cable lines should not pass through forests, orchards, tea gardens, nurseries and other economic forest plants.

2. THE KEY POINTS OF COMMUNICATION TRANSMISSION LINE CONSTRUCTION TECHNOLOGY

During the construction process of communication transmission lines, the basic points of construction operations also need to be highly valued, and the following aspects need to be grasped during specific operations.

2.1 Select a transfer rack

In the actual construction operation process, the more commonly used transmission poles are cement poles. The strength of cement poles is ideal, and it also has ideal corrosion resistance, so that the reliability of transmission can be fully guaranteed. Of course, it is also necessary to pay attention to its basic model. For example, the length of the transmission pole needs to be properly selected, and the transmission pole of the appropriate length should be selected for construction in combination with its basic terrain requirements.

2.2 Pole

For the construction operation of the pole, it is necessary to focus on the basic operating points of the pole, and strictly limit the basic parameters involved in the construction, so as to be standardized and reliable, especially to avoid the problem of inclination or inaccurate position behind the pole. In order to better improve the construction quality level of its poles, prestressing technology can also be effectively used for processing. During specific construction, the pole position of the straight line should be on the center line of the line route, and the left-right deviation between the center line of the pole and the center line of the route should not be greater than 50mm. The erected electric pole itself should be vertically downward, and the inclination of the front, rear, left and right of the pole tip should not exceed one-third of the tip diameter of the reinforced concrete pole, and no more than one-half of the tip diameter of the wooden pole. The tip of the terminal rod should be inclined 100mm to 200mm to the opposite side of the wire tension. The root of the corner pole should be moved inward at the corner of the line; the cement pole should be moved inward by about half the root diameter, which is about 100mm-150mm, and the wooden pole should be moved inward by about one root diameter, which is about 200mm-300mm. The root of the corner rod of the rod may not move inwardly.

2.3 Aerial pole road stay wire

Affected by its own gravity, there will be unbalanced tension on the overhead pole road. In order to ensure the safety of the overhead pole road, it is necessary to install guy wires. During specific construction, the newly installed guy wires must be carried out before laying the hanging wires. Before removing the stay wire, you must first check the condition of the old pole, and then remove the original optical cable and hanging wire on the pole in order. The steel strand used for the terminal cable must be one level larger than the suspension wire, and the pull distance must be guaranteed. The ground anchor and the ground anchor

should be matched with the steel strand. It is strictly forbidden to use non-matching ground anchors or ground anchors, and it is strictly forbidden to saw the ground anchors short or bend them. When replacing the cable, the new cable should be installed, and the old cable should be removed after the tension of the new cable has loosened the tension of the old cable. When installing a new guy wire at the original guy wire position, a temporary guy wire should be made first to prevent the ground anchor of the original guy wire from being dug out when digging a hole, resulting in insufficient tensile force, causing the ground anchor to move and cause a rod down accident. When installing the pull wire, try to avoid places that hinder pedestrians and drive, and install the pull wire warning sheath. After the guy wire is installed, the guy wire pit must be compacted when backfilling the soil.

2.4 Hanging wires

Pay-off reels must be used when laying coilless steel strands, and laying steel strands without pay-off reels is prohibited. The steel strand is laid manually, and the dry hemp rope must be used at the front end of the traction (the hemp rope is firmly connected with the steel strand) for traction. Before laying steel strands, the power supply lines, highways, railways, streets, rivers, trees, etc. that cross along the way should be surveyed and counted, and effective measures must be taken during laying to pass safely. When passing through the branches, the branches shall not be used to block pressure or support the steel strand to ensure the height of the hanging wire. When passing power lines, highways, railways, and streets, the design height should be calculated and guaranteed, and the fixed position of the steel strand on the pole should be determined. Warning and warning must be carried out before the traction steel strand passes. If the steel strand is on the low-voltage power line, a special person must be set up to hold the steel strand with an insulating rod, and it must not be dragged on the power line. When pulling the steel strand margin in the whole process, the force should be uniform, and measures should be taken to prevent the steel strand from bouncing between poles and touching the power line due to tension rebound. Before cutting the steel strand, both ends of the cutting point should be manually fixed,

and then loosened after cutting to prevent the steel strand from rebounding. When tightening the stay wire or hanging wire, the operator must be on the left and right sides behind the wire tensioner.

2.5 Grounding protection

In order to ensure the safety of communication transmission lines and avoid accidents in thunderstorm weather, grounding protection must be set. Grounding protection must be arranged around the entire system engineering to avoid grounding failure in any link. During the specific construction, the overhead line can be grounded by a pull wire. After the optical cable enters the equipment room, the strengthening core must be connected to the lightning protection ground wire row of the ODF frame.

3. CONCLUSIONS

To sum up, with the rapid development of communication technology, especially the arrival of the 5G era, the design and construction technology of communication transmission lines have attracted more and more attention. When designing and constructing communication transmission lines, it is necessary not only to ensure the safety and reliability of communication transmission, but also to reduce construction costs as much as possible and achieve optimal design in light of site conditions.

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A Novel Path Planning Algorithm for Industrial Robots and Its Simulation

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Abstract: It is necessary for industrial robots to automatically avoid obstacles and plan paths during their work process. In response to the problems existing in the artificial potential field method, this article replaces the potential field force function with a potential function, and adds factors such as changes in the joint angle of industrial robots to the gravitational potential function, and factors such as the relative distance between the robot's current position and the target position to the repulsive potential function. At the same time, a temporary target point is added to the RRT algorithm, and finally, simulation verification is conducted. The test results show that the method selected in this article has planned a safe and efficient path, ensuring the safe obstacle avoidance of industrial robots.

Keywords: Industrial Robots; Avoiding Obstacles; Artificial Potential Field Method; Path Planning

1. INTRODUCTION

Obstacle avoidance and path planning are the primary considerations for industrial robots to complete their work, and related research has always been the mainstream research direction of industrial robots[1]. Unlike mobile handling robots such as AGVs, industrial robots cannot be simulated as an idealized particle or simply consider path planning at the end of the industrial robot due to the existence of 6 degrees of freedom, interconnected constraints between each link, and the fact that industrial robots generally operate within a finite interval. Most of the various path planning algorithms are applicable to various mobile robots, but if they are to be applied to industrial robotic arms, some improvements are needed. In addition, industrial robots that no longer work alone have human or non human obstacles within their working range, and the movements of various obstacles are unpredictable. In such a non-static working environment, the real-time performance of obstacle avoidance algorithms must be guaranteed[2].Therefore, after considering the various requirements mentioned above, this article has decided to choose the artificial potential field method[3], which has been validated multiple times, as the specific algorithm for planning the working path of FANUCM-20iA in joint space, and to simulate and prove the improved algorithm.

2. ALGORITHM PROCESS

In our method, we decide to combine the RRT algorithm[4] to add temporary target points in the direction of the true target point, ensuring that the industrial robot departs from local minima. The overall idea of the joint algorithm considered in this article is that when an industrial robot relies on the artificial potential field method for motion, once it enters a local minimum point, it is set as the root node of the search tree, and then finite expansion is performed to find a new node. The new node closest to the target point is used as the temporary target point of the robotic arm, and the potential field method is used to plan the path of the robotic arm, so that the robotic arm first moves to the temporary target point and then moves to the target point.

Step1: Determine the joint angle combination of the starting pose of the robotic arm and the joint angle combination of the target pose. Use the visual sensor selected in this article to establish the corresponding bounding box model of the obstacle, and select appropriate parameter values of the improved potential field method potential function;

Step2: Based on the current joint angle combination θ When searching for adjacent joint angle combinations, this article simplifies the calculation process by neglecting joints4and6 and improving the computational speed when constructing bounding boxes;

Step3: Use the forward kinematics equation to solve the linkage joints and end coordinates of the industrial robot corresponding to all joint angle combinations;

Step4: Construct the bounding box of the industrial robot using the connecting rod joints and end coordinates, conduct collision detection on the industrial robot, discard the joint angle combinations that have collided, select the joint angle combinations that have not collided, and calculate the shortest distance between each connecting rod and the obstacle, as well as the distance between the end point and the target point of the industrial robot;

Step5: Calculate the total potential energy contained in each joint angle combination selected inStep4, select the joint angle combination with the smallest total potential energy and the corresponding end position of the robot;

Step6: Determine whether the end position obtained inStep5is the target point position. If so, the industrial robot has reached the target point position and completed the path planning; If not, proceed to step7 for judgment;

Step7: Determine whether the joint angle combination with the minimum total potential energy is the current

joint angle combination of the robotic arm. If not, the industrial robot moves to the corresponding position of the joint angle combination, and then goes to step2 to recalculate until the end of the industrial robot moves to the target point position, that is, the robot moves towards the direction of the decrease in total potential energy within the working range, and successfully plans a collision free working path;If so, the industrial robot enters the local minimum point and its motion stops. At this point, it enters step8 to escape the local minimum point.

Step8: Follow the process of applying the RRT algorithm to the robotic arm above, using the local minimum point as the root node, iterate finite times, select a temporary target point, and the robotic arm will escape from the local minimum point. Go to step2.

3. SIMULATION ANALYSIS BASED ON MATLAB

In order to validate the algorithm proposed in this article, the motion of the robotic arm was simulated using MATLAB .To verify the reliability of the improved algorithm in this article, a spherical obstacle is added to the working area of the robot. The initial joint angle combination of the industrial robot and the coordinates of the target point are the same as before, and the coordinates of the spherical center surrounding the ball are (1500,-400400) with a radius of 80mm. The end path of the industrial robot is shown in Figure1, and the distance between the selected link and the spherical obstacle is shown in Figure 2.
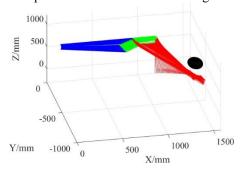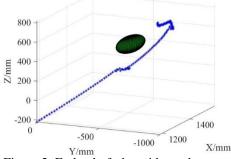

Figure 1. Overall motion of industrial robot

Figure 2. Endpathofrobotwith an observer
Observing Figure1and Figure 2, given the initial pose and target point position of the industrial robot, the industrial robot searches for a path with the fastest potential field reduction throughout the entire working range, while avoiding obstacles and successfully reaching the preset position. The motion path of the end of the industrial robot is relatively smooth, overcoming the problem of unreachable targets and completing the established work. It can be seen that throughout the entire process of industrial robot movement, each link joint of the robot safely avoids obstacles, and the distance between each joint and the obstacle consistently exceeds the preset safe distance, proving the success and reliability of the overall obstacle avoidance of industrial robots. At the same time, the changes in various joint angles of industrial robots are relatively gentle and stable, and there is no problem of singular point mutation, which also proves the safety and reliability of the improved algorithm in this paper.

4. CONCLUSION

Based on the advantages and disadvantages of path planning algorithms, the artificial potential field method was chosen as the obstacle avoidance algorithm. Based on the characteristics of industrial robots themselves, it is decided to abandon the potential field force function and choose the potential function. In response to the shortcomings of traditional artificial potential field methods such as unreachable targets and local minima, this paper also adopts corresponding improvement methods. The simulation results show that the improved algorithm in this chapter solves the above two problems, and successfully helps industrial robots complete collision free path planning.

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Research on the Popularization Path of China Youth Campus Football

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Abstract: China's youth campus football is a cooperative project of the Ministry of Education and the State General Administration of Sport, in order to improve the youth's physical fitness play a positive role, but also it can play a basic role in the football Olympic glory plan, so it is another active attempt to integrate sports and education. The popularization of youth campus football mainly includes: improving the coverage rate and normalization of campus football matches, improving the utilization efficiency of campus football field resources, paying attention to the construction of campus football culture, and raising diversified funds for campus football.
Keywords: China Youth Campus Football; Popularize; Resource Utilization; Football Culture

1. INTRODUCTION

In July 2015, the Ministry of Education jointly issued the "Implementation Opinions on Accelerating the Development of Youth Campus Football", which shows the importance of the national management department to the football project, which can be said to be a milestone event in the "combination of sports and education"[1]. At present, the campus football competition system has been constructed, which mainly includes intra-school competition, inter-school league and regional selection competition, and has built a horizontal and orderly and vertical integration of university, high school, junior high school and primary school league operation mechanism, implementing graded management of events[2]. Ithas formed a complete county, city, provincial and national competition system. The standard competition system of campus football league has been basically formed. However, the serious shortage of youth soccer talents has become the biggest problem in China's soccer development, most of them are studying in schools, so the scale of campus soccer development is the premise of whether China's soccer projects have international competitiveness, and the quality of campus soccer development is related to the sustainable and healthy development of Chinese soccer projects.

On January 12, 2015, according to the requirements of the Party Central Committee and The State Council for work deployment, in order to further promote campus football work, with the consent of The State Council, a leading group was organized by the Ministry of Education to be responsible for China's youth campus football work. To sum up, the youth campus football league refers to a national youth football competition organized by the education department.

The popularization of campus football is the foundation[3]. The campus football activities are mainly popular, the purpose is to let more children learn to play football, often play football, to achieve the healthy development of physical and mental quality; By learning and observing the technical rules and codes of conduct in football activities, early development of social adaptability, experience and adapt to social rules and ethics; To promote the improvement of intelligence level through the use of skills and tactics in football activities.Through the training and competition in the football team, enhance the team consciousness and assistance ability, etc., to help the young people's moral, intellectual, physical, American and labor comprehensive and healthy development.

From the perspective of campus football popularization, according to the results of field investigation and evaluation, the two indicators of "the coverage rate of students participating in campus football matches" and "the proportion of students participating in extracurricular football activities" reflect that the actual popularity of campus football in "schools with football characteristics" is not high. In general, cities are better than villages, and primary schools are better than secondary schools[4].

In the field investigation, it is found that the football schools have a fixed amount of campus football special funds issued by the education authorities every year, and each school is fully able to achieve a special fund, so that the development of campus football activities has a stable financial guarantee. The schools in other areas do not have a fixed investment in this area, but most of the football schools are relatively supportive of the development of campus football in terms of funds, and there will be an irregular investment in sports funds every year, but there is no football special funding plan, which depends on the specific situation.

As for the construction of campus football culture, the schools in the survey generally do not pay enough attention to it. It is not found that any school has specially held activities such as campus football culture festival and culture week. Some schools have simply promoted football activities by means of publicity bars, radio stations, school websites and wechat groups during campus football matches. In terms of new media platform construction, there is no

special football webpage of the school, and most schools report football news from time to time under the main webpage. In the application of wechat group and QQ group, it is also limited to a small range of training, competition, community activities and other information, such as school football parents group, school football team group, football community group, etc.

the provincial education departments have issued a number of documents in September 2017. These documents will be students' participation in sports activities, students' physical and mental health level as the content of comprehensive quality evaluation, and as a fixed subject in the middle school examination, sports part of the three big ball exam. This opportunity to carry out campus football activities has become a part of the exam-oriented education. The introduction of these documents will greatly promote the active development of junior high school football activities and improve the popularity. The Ministry of Education is increasing the reform of physical education and the comprehensive quality assessment of the examination in the high school stage, and even the future will be like the high school entrance examination, the physical education examination as a fixed subject of the college entrance examination and occupy a higher proportion of scores. I believe that the popularity of high school campus football will also be significantly improvedin the near future.

2. THE POPULARIZATION PATH OF YOUTH CAMPUS FOOTBALL

2.1. Improve the coverage and normalization of intramural football competitions

The organization of the school football league is the most direct platform to achieve the goal of campus football popularization, through a series of scientific arrangements for class team formation, game methods, game scheduling, field allocation, time allocation, etc.. But it does require the joint efforts of physical education teachers and even all the school staff. It should be said that students' physical and mental education, ideological and moral education, intellectual education can be realized through the platform of campus football league.

The normalization of football association activities is another important means of popularization in addition to football teaching and football league[5]. The School football association activities can meet the participation needs of those young people who love football. The football classes are held once or twice a week, and the football league also has a specific time. On the one hand, the normalization of club activities can make up for the shortage of football teaching and league in terms of time, and on the other hand, enriching the amateur cultural life of teenagers. Because in the relatively closed campus environment, there are special football teachers to organize and guide activities, and the students who participate in the activities have a common hobby, and the parents are

more assured about the children who participate in football activities in the school.

Of course, whether it is a football match or football association, it is necessary to carry out activities under the principle of "safety first". The actual investigation found that every school has a sports risk prevention and control system and injury accident handling plan, but most schools do not publicize these documents and information, teachers. The parents and students will not have a detailed understanding of these contents, let alone strict implementation. In addition to strictly doing a good job in teaching, training, competition, association and other activities related to football safety, The physical education teachers should regularly and consciously impart to students a series of knowledge and skills, such as prevention of sports risks before sports, self-protection during sports, and emergency treatment after sports injuries.

On the basis of the full implementation of school liability insurance, all young people who often participate in football activities are required to purchase sports accident insurance. The students who participate in competitions on behalf of the school are uniformly purchased by the school for a single participation in sports accident insurance, forming a variety of combination insurance forms to jointly provide safety guarantee for young people to participate in campus football activities.

2.2. Improve the utilization efficiency of campus football field resources

The football field is the hardware basis for campus football activities. A series of problems have been found in the actual investigation, such as small field, few fields, irregular shape and poor material, which really restrict the development of campus football activities. However, these field problems are limited by various conditions them cannot be solved in a short time form the reality. Therefore, how to make full use of the existing site conditions, it is particularly important.

As the saying goes, "things are dead, people are alive", how to make the best use of things, give full play to the maximum effect, which should be the fundamental idea of making up for the lack of facilities in the development of campus football activities at this stage. With fewer venues, reasonable arrangements can be used to exchange time for space, so that young people can have activities at every time on the football field, including recess and lunch break. As the venue is small, different teaching and training contents can be arranged scientifically by means of class or group rotation, circuit training, actual combat analysis, etc., for example, a group of on-field confrontation, two groups of on-field actual combat analysis of the skills and tactics of a group, three or four groups of off-field different physical fitness exercises, and the content of group activities can be rotated every ten minutes. The field is irregular, and the existing shape of the field can be used according to local conditions, and the

characteristic football techniques and tactics can be reasonably developed, and the unfavorable conditions can be transformed into favorable factors. If the field is long and narrow, practicing the middle penetration tactics and the technique of a short pass; If the field is square, practice two side attack, bottom cross and head shot skills and tactics. The surface material is hard or sandy, although the risk of falling and injury is increased, but the threat can be reduced by wearing protective equipment. Often on the hard ground to play football which requires young people to have more excellent pass and catch, dribbling and other skills, the basic skills are more solid.

2.3. Attach importance to the construction of campus football culture

At present, to improve the popularity of campus football activities, we must first change the wrong concept of school, parents and students on football[6]. With the good opportunity of high school football examination, increasing the propaganda of campus football activities, fundamentally change the wrong idea. The primary and secondary school leaders, teachers and parents do not attach importance to sports and football, so that teachers and parents are willing to even urge young people to actively participate in football activities. One of the effective ways to achieve this goal is to strengthen the construction of campus football culture and create a cultural atmosphere conducive to the popularization of football activities.

Holding football culture Festival, Culture Week and Culture Month on a regular basis, and carry out a series of football-related activities in various forms and contents, such as parent-child football match, football game, football photo contest, football funny short video contest, football speech or story contest, etc., inviting teachers, parents and students to participate in and experience the fun of football activities. Learning the knowledge and skills of football activities to stimulate people's interest in football. Building the school's own independent campus football website and wechat public account, which are managed and maintained by special personnel and frequently updated and released information, such as the series related to football and adolescent health knowledge, the series related to football risk prevention and control, injury prevention, emergency treatment knowledge and skills, and the series introducing the history and latest situation of football development. History of famous football players and their wonderful game video collection series, football humorous stories and fun football video series, technical and tactical teaching short video series, inside and outside the school football game photos and video series and so on.

At the same time, putting forward the basic requirements and standards of cultural course learning for the selected class team, grade team and school team, such as cultural course scores can not be lower than the average score of their respective classes or grades.

If these case be found to youth player, the first warning will be given, the deadline for one month to meet the standards, otherwise it will be suspended training, suspension punishment. When they meet the standard, they can re-apply to join the team, and the football coach and the head teacher jointly examine whether they are qualified to resume the identity of the football player. Such a rule must be in writing and can become a campus football rule that can be strictly enforced for a long time. Such a system, on the one hand to solve the parents worried that children because of playing football and affect the academic performance of the worries, on the other hand is also an effective means to promote football players to study hard.

2.4. Diversification of campus football fund raising

The local education authorities should set up special funds for campus football activities and invest fixed development funds for schools featuring football every year[7]. If we want to continuously promote the development of campus football, we must have a certain amount of special funds every year, and we should gradually increase the amount of investment with the development. At the same time, the schools can't meet the needs of the future development of campus football only by the input of government departments, so they should broaden the channels of funding investment and try to take the path of socialization and commercialization. It is necessary to seek broader support from the society, promoting the long-term cooperation between "campus football" and enterprises, and obtain social funding. The social force is infinite, them are closely linked by the "campus football" and the social economy, and the school-enterprise cooperation. Such as the naming and sponsorship of enterprises, the commercial operation of football clubs, the one-to-one joint team of schools and enterprises, and the participation of social groups in school football development, etc., and strive for more abundant development and construction funds through various channels, then the shortage of funds and the lack of venue facilities will be effectively compensated.

3. SUMMARIES

The development of campus football has obvious Chinese characteristics. The organization and management of campus football exist in a situation of multiple management. The State General Administration of Sport is the dominant organization department, while the State Education Commission is the implementation department. Under this system environment, campus football can only move forward with difficulty, and the effect can be imagined. However, as researchers, we still appeal to the upper management departments to understand scientific management, reflecting the spirit of scientific management, and truly contribute to the improvement of youth physical fitness and the Olympic glory program.

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Research on the Education Implementation Method of National Youth Campus Football Sports

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Abstract: Because the school is the main place for the activities of young people in this age group , the schools of all levels have become naturally the main front for the implementation of campus football. Campus football has obvious functions for the education of young people, it plays an important role in the physical fitness of young people, and it can also cultivate students' awareness of rules and teamwork spirit. The path of youth campus football education includes mainly: the stability of football teaching class hour, the professionalism of football teachers, and the scientific content of teaching.

Keywords: Campus Football; Educating People; Path

1. INTRODUCTION

The Ministry of Education promulgated the"Implementation Opinions on Accelerating the Development of Youth Campus Football" in July 2015[1],which shows the importance of the national management department to the football project,it can be said to be a milestone event about the "combination of sports and education". At present, the campus football competition system has been constructed, which mainly includes intra-school competition, inter-school league and regional selection competition, it has built a primary school league operation mechanism of horizontal and orderly integration of university in high school, junior high school,and implementing graded management of events. It has formed a complete county, city, provincial and national competition system. The standard competition systemhas been basically formed in campus football league.Howeverthe serious shortage of youth football talents has become the biggest problem in Chinesefootball development, because most of them are studying in schools.The scale of campus football development is the premise of Chinesefootball projects, and the quality of campus soccer development is related to the sustainable and healthy development of Chinese football projects.

The education function is the first place about campus football. Morality, intelligence, sports, beauty and labor are important parts of education. The football is a collective sports project, which can cultivate the collectivism concept, organization and discipline of young people. By participating in campus football activities, it can cultivate various physical qualities of teenagers, such as strength, speed, endurance, flexibility, sensitivity, coordination, etc., promoting their physical health and growth and development, at the same time, it can cultivate their good psychological and intellectual quality, as well as cultivatebrave and tenacious will quality.

There is no doubt that campusfootball plays a positive role in the physical and mental health of teenagers. However, due to influencing of wrong traditional concepts and the limitations of the original examination system, The society, schools, families and teenagers themselves have not a small misunderstanding of participating in sports activities including football[2]. Therefore, since the pilot of campus football activities began in 2009, The development have 8 years, The development of campus football activities is still not optimistic. In the actual investigation, it is found that the development of campus football activities is better in primary school than in junior high school, and junior high school is better than high school.

The director of the Department of Physical Education in 2014, Health and Art Education of the Ministry of Education have delivered the information of physical education reform in participating in the second provincial and municipal Secretary-General meeting of the 12th National Student Games, "The current policy orientation is that the score value of physical education subjects in the high school entrance examination will be increased year by year, until it is equal to the language and other subjects.""While the sports extra test system becomes more mature, scientific and objective, it can provide references for the sports test of the college entrance examination, in which sports scores will also become an important criterion for talent selection[3]." He introduced that the physical education test has been included in the academic level test of the college entrance examinationat present, and has become the reference basis for the college entrance examination by in the form of "pass or not".The physical education will become an objective quantitative evaluation method of ABCD level in the college entrance examination in the future, and becoming one of the admission criteria of the college entrance examination. "The college entrance examination will also change from a single intelligence evaluation standard to a comprehensive

quality evaluation of morality, intelligence and physical beauty ."

The PE testing will be transformed from the original focus on students' physical fitness testing to the direction of basic sports skills and specialized sports skills from the perspective of PE teaching reform. The standard of skill level should be established for specialized motor skills. In the future the sports skill level is linked with the score, which can better reflect the real effect of physical exercise in daily life.

The reform of the education system provides an important guarantee for the educational function of campus football activities in terms of policy and system. The football skill test (round the bar) is now one of the important contents of the sports test in the provincial entrance examination. The survey found that a large proportion of the students in the third grade choose football for practice and examination[4]. In the future, sports tests will pay more attention to the investigation of sports skills,it will be more necessary to adhere to sports activities at ordinary times, and sports will be added to the college entrance examination as one of the admission criteria. These reform measures will undoubtedly guide society, schools, families, and students to attach importance to campus sports activities, including football.It can help students develop the habit of physical exercise, which will benefit them for a lifetime.

It can be seen that the three key elements to realize the function of campus football education, including fixed weekly football class hours, professional football teachers, scientific and rich teaching content.

2. EDUCATION PATH OF YOUTH CAMPUS FOOTBALL WORK

2.1.Stability of football lessons in training programs

For the real effect of campus football activities, it is not as important as the football class that guarantees a fixed class time every week, such as complete the documents, systems and other materials, and very good the hardware facilities and equipment. Although the Ministry of Education stipulates that elementary, middle and high school soccer schools must have a fixed number of hours of football content every week, The implementation is not ideal in fact. Some schools have no football teachers, some schools are short of venues, some schools are lax in supervision, and so on, resulting in the inability to guarantee the teaching time of football class[5]. So the teaching quality and the realization of the education function is realization.

We believe that the campus football activities can not guarantee the proper teaching time in the characteristic schools, the effect of campus football activities will be greatly reduced, which can be directly reflected from the physical quality of students. The reason is that the school's attention is not enough, and the competent authorities lack supervision. Even if lack of the football teacher, it can have the football class, there is no special person to teach technology, firstly carry out football games to cultivate interest. The problem of space shortage can be overcome by reasonable arrangement of class time, reasonable allocation of space, reasonable selection of teaching content and other methods. Of course, the solution to the above problems requires the relevant personnel to have a high sense of responsibility and positive work attitude. First of all, we should ensure the time of football class as the basis, improving the participation of young people in football activity class. Taking cultivating interest as the starting point, we should gradually master the basic skills of football and improve the comprehensive and basic physical quality of young people. In addition, it is more important to put the supervision into practice, inspection and supervision can not just "say on the document, mention at the meeting". The competent departments of education at all levels should do long-term supervision of the "football characteristics school" football opening situation, such as irregular, surprise spot checks, dark checks, "look back", etc..We should find problems in time to deal with and correct, Regular return visit and investigation of the rectification situation, more observation and covert investigation, less interview and material reporting, to obtain the real situation of football teaching in each school.

2.2. Professionalism of football teachers

Although one of the selection criteria for football schools is "at least one football-specific physical education teacher" , while the actual investigation found that some football schools that have been selected do not meet this requirement. Special football teachers are not necessarily professional football teachers, that is to say, "special" is not necessarily "professional", although there is only a word difference, but the concept can not be confused. Just as we often say :"excellent athletes do not necessarily make excellent coaches", the football graduates do not necessarily become professional football teachers.

Professional football teachers not only need to master professional football knowledge and skills, but also need to have a series of comprehensive qualities that should be possessed by professional football teachers[6], such as ideological quality and psychological responsibility, dedication, innovation consciousness, desire for knowledge, learning ability, etc. Comprehensive and professional knowledge of education, psychology, anatomy, sports physiology, sports medicine, sports training science, sports nutrition, sports biomechanics, sports biochemistry and other disciplines, only with such comprehensive quality and ability, who can be competent for daily football teaching, community activities, amateur training, competitive competition and many other complex work. Therefore, schools without special football teachers should speed up the introduction, training speed and quality. Education and sports departments should coordinate and cooperate to supplement retired high-level professional football players to schools at all levels and types through

dispatch or recruitment, and college football graduates with solid professional knowledge and skills and excellent comprehensive quality can also be selected from colleges to enter ordinary primary and secondary schools as football coaches.

With special teachers of the schoolsshould strengthen the improvement and training of the comprehensive quality and ability of existing teachers, andthem should inspect and superviseregularly the campus football work. First of all, establishing a standardized training system for campus football coaches and instructors, in order to promoting the comprehensive quality and professional knowledge and skills of existing grass-roots coaches and physical education teachers to be steadily improved, improving the work level of coaches, physical education teachers and management personnel. The ability of coaches to learn and use football professional skills is constantly improved through training courses, learning classes and competition practice. The formation of innovation consciousness is promoted. Introducing a certain competitive incentive mechanism, clarify the work tasks and responsibilities of coaches, assess and reward coaches according to the year and stage, and improving the salary of coaches to a certain extent.

2.3.Scientific teaching content

In the process of field investigation, it was found that although the school has opened football classes, some schools have no fixed content of football classes, which is arranged by the teaching teachers themselves, and the teaching teachers have no teaching syllabus or teaching plan. The choice of teaching content can be described as "unconstrained" and "whatever one wants".What is more, the so-called football class in some schools is actually to give students a football, and then let them go to their own free activities, that is, the so-called "sheep style". In the survey, some teachers reflected that the football content in the existing physical education textbooks could not meet the needs of football teaching in characteristic schools at all, and they could not find scientific and systematic football teaching materials published by national or regional authorities, so they had to integrate and sift the scattered materials and foreign materials collected on football teaching and training. Compile football school-based courses or simple teaching programs to solve urgent problems. The teachers who compiled the teaching materials by themselves have done a lot of work in their spare time based on their love for the teaching profession and football sports, which is admirable. However, there are still some teachers who cannot prepare the school-based courses by themselves due to various reasons and conditions.

Of course, the best solution is for the Ministry of Education to plan the compilation and distribution of youth campus football course textbooks and syllabi, which is also being actively carried out. These teaching materials should be led by the competent departments of education and sports, and experts play various roles such as pedagogy, physical education, football coaches and physical education teachers , who should contribute their advice and suggestions. Only through repeated demonstration, deliberation, modification and small-scale experimental application can the scientific and feasible teaching materials be ensured as far as possible. In addition, the training plan for amateur football training should also be completed by the leaders, teachers, coaches and students in charge of campus football activities in each school, and should also reflect the scientific, rational and feasible. These teaching and training materials should be highly targeted, according to the characteristics of the region and the nation itself,the characteristics of the physical and mental development of young people at different ages, the characteristics and laws of the development of football sports, otherwise it will not be able to achieve the development goals of campus football at all levels and types we have set.

At this stage, the lack of uniform national or regional football teaching materials or documents can only rely on the selfless dedication and professional attitude of teachers[7]. When the teachers choose the teaching content, the first consideration is to stimulate the interest of young people in football. The football interest is the premise of forming motivation, and the football motivation can help correct the attitude of students to participate in football activities, so as to guide the behavior of participating in football activities, and ultimately help develop the habit of football activities. All kinds of teaching content of students are interested in , and which can attract more teenagers to actively participate in it is the primary prerequisite for campus football activities.

Secondly, the selection of teaching content should conform to the law of physical and mental development of teenagers at different ages. Most of the primary school students have not entered the youth development period, the childhood strength, speed, endurance is not the main improvement of physical quality. During the period of time to cultivate children's sensitivity and coordination quality, learning and mastering the stop, transport, top, shooting, grab and other basic technology, The competition and game should be used more small venues, so the requirements for physical quality is not high, thus The main training basic skills and football tactical awareness. Middle school stage is in the youth development period, height, weight, strength quality, speed quality, endurance quality will increase very obviously, this period can be appropriate to increase the load content of physical training, such as short distance sprint run, change direction dribble running, variable speed dribble and other football special speed quality exercises, as well as increase strength quality and physical confrontation exercises. The football belongs to the same field antagonistic event group, to develop the ability of teenagers to play various skills steadily in the case of physical confrontation. For

group sports, the rational use of skills and tactics which have a very good effect by regular training of team cooperationon the training of young people's logical thinking ability, team cooperation ability and social adaptability. Therefore, themare an important content of football teaching and training in middle school about the cultivation of comprehensive application of skills and tactics and reasonable distribution of physical ability.

In addition, it is found that all schools lack the establishment of a systematic and complete soccer learning file for each studentin the actual survey, which should continuously record the comprehensive situation of students' soccer learning performance, the change trend of key indicators of physical fitnessand the mastery of soccer skill indicators in stages. By the field investigation, most schools did not have any relevant records, and individual schools only registered simple information about school team members or activists, such as application forms for football teams or clubs. No cases were found of systematic and continuous documentation of all students' participation in football activities.

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Abstract: Mumbai, India, serves as a potential market for expansion for the Japanese- clothing apparel Uniqlo. The company's core competencies come from simple fashion with the Japanese conservative culture that aims to offer low- cost clothing targeting the youthful generation. The Indian city of Mumbai is a perfect destination being a cosmopolitan which over 22 million residents. This is market and labor for apparel companies. Uniqlo, however, will have to go through the strong competition from both local and international players. Uniqlo has a chance of succeeding in the market based on a relatively conducive macro- environment except for the social and cultural environment that will pose a challenge to employees, especially foreigners. India's technology is also encouraging an environment for human resources practices. Therefore, a contingency approach would help Uniqlo handle its HRM practices. The report, therefore, recommends a mix of ethnocentric and polycentric staffing from both host- country nationals and parent- country nationals considered for work to help maintain culture fit. It is also recommended that training on cultural awareness and induction training will help realize organizational performance based on impact on learning. The HR director might also consider taking advantage of e- recruitment to bring on board the best talents.
Keywords: Mumbai, India, Uniqlo, HR Theories, HRM Practices

1. INTRODUCTION

Every business desires to grow and expand beyond the national boundaries of its parent country. One of the critical issues that form the determinants for expanding into international space is human resource practices. Thus, when multinational companies set their ventures in the international market, there is always the urgency to implement appropriate human resources practices, approaches and strategies. This is driven by the need to ensure that the venture remains in operations and is able to fit well and become competitive in the new market. It is essential to acknowledge that human resources practices and approaches determine whether an organization will succeed in the international or not. The report focuses on identifying appropriate human resources approach, strategies, and practices for Uniqlo that will guarantee success as it seeks to expand its operations into the Indian city of Mumbai. The report will explore the market and industry dynamics to help inform its recommendation of appropriate human resource dimensions that will guarantee organizational performance. Specifically, the report breaks down the human resource practices into training and development, HR technology and recruitment and selection practices that will guarantee organizational performance in Mumbai.

2. COMPANY PROFILE

Uniqlo is a Japanese company dealing in clothing apparel dealing in casual wear, manufacturing and retail. The textile manufacturer was established in the Japanese city of Yamaguchi in 1949 and since then, it has expanded globally and surpassed 1500 stores spread across 25 countries as of 2021 (Uniqlo 2022). The company has operations in different countries around the world, including the UK, Canada, Australia, Belgium, and China, among other nations (Yi 2016). Today is the largest apparel retail outlet in its domestic market, controlling a market share of 6.5 percent.

The company focuses on low- cost clothing as its business strategy, which has given it great success in the Asian market and helped make its brand popular across the globe. The pursuit of the international market has been made possible through the support and contribution of a workforce of over 30,000 employees working in various stores in the supply chain (Uniqlo 2022). It is through the support of the workforce that has been able to register a brand value of approximately US\$ 13 billion between 2016 and 2021 (Forbes 2022).

In terms of the target market, Uniqlo historically focuses on both males and females with age variations between 18 years and 40 years old. The company anchors its core competencies on fashion basics, cost and time factors in the market. Uniqlo's products are known for their simplicity and timelessness, such that they largely fit a wide range of ages. The ability to maintain the core competencies in the market can be attributed largely to the human resource functions such as training and development, which have ensured that the staff maintains the organizational standards and culture. However, Uniqlo faces immense weaknesses, especially when it comes to the integration of

different working cultures, as it largely focuses on the Japanese culture. Moreover, the company also faces a high attrition rate, especially when compared with its peer in the apparel and clothing industry.

3. OVERVIEW OF THE HOST COUNTRY

Uniqlo's desire to expand into the international market has been able to set its operations in at least 25 countries directly. India is one of the countries Uniqlo has made an attempt to operate; however, the operation is limited to single or few cities. However, it also desires to widen its operations into other cities in the country, in this case, Mumbai.

3.1 Host Country Profile (India, Mumbai)

Mumbai, also known as Bombay, is an Indian city in the state of Maharashtra and lies on the Konkan coast on the west coast of India. Mumbai is one of the most populous cities in India, with a population of 20.9 million people as of 2021 (MacroTrends 2021). The city is regarded as the wealthiest in India and it is the home to most of the billionaires in the country. The city has males sightly outnumbering the females, with 41 percent of the population living in slums (Zhang 2016). However, Mumbai is regarded as a global city in which it is globally connected and, therefore, offers a primary connection to other cities around the world. This means that the city attracts people from all cultures around the world. Uniqlo has plans to penetrate the Indian market and set its outlet in the city of Mumbai. Currently, Uniqlo serves the Indian city of Mumbai through an online platform that allows for the shipment of their purchased products.

3.2 Industry Profile competitors

The apparel industry in the Indian cities and the country, in general, contributes an average of 5 percent of the GDP and accounts for the country's 12 percent export earnings every year (Tyagi 2021). The industry is integral to the economy of India, considering that India is regarded as the sixth exporter of textile and apparel across the globe. The Apparel industry in India is quite crowded, with both local and internationally recognized players having a strong market presence. Sharma (2021) observes that the industry is quite large such that it is the third-largest player in employer in the economy employing directly 45 million people. The market in India has great opportunities that will work to the advantage of foreign-based seeking to operate in the country. The population size offers a ready market for the apparel products but also a huge pool of skilled labor that can influence the recruitment process of an organization. Moreover, India is also one of the countries with advanced technological integration in the business environment, which creates an opportunity for companies seeking to operate in the market to adopt its usage even in areas such as human resource management. However, the greatest threat in the Indian market

would come from employee skills by different cultural practices, which will affect processes such as training and development.

Uniqlo will appreciate that traditional clothing still remains a critical and defining trend in the Indian market. For instance, traditional clothing for women in India accounts for more than 70 percent of total women's sales in 2017 (Amed et al. 2019). Another trend in the Indian market in the Indian market is the production of eco-friendly clothing, where brands are focusing more on recycling and customization of clothing to avoid wastage. In other words, companies in the Indian apparel industry are seeking the introduction of eco-friendly clothing as means of developing a competitive advantage. Among the Indian companies leading in the eco-clothing in India include companies such as Doodlage, Mixmiti and Nicobar, even though the scale of operations might be limited for some of these companies. Uniqlo will, therefore, be impacted by these trends in terms of their recruitment and selection processes, staff training and development as well as HR technology. The industry, however, has its set of challenges that players seeking to operate in the Indian market will have to appreciate. For instance, a lack of requisite skills in the market means that any Uniqlo will spend a significant amount of time training and developing the capacity of the workforce. This has also been furthered by low education levels as well as cultural differences.

Competition in the Indian market and Mumbai, to be specific, is quite intense, considering that both domestic and international players are jostling for space. However, Uniqlo will face competition from other brands such as HM and Zara. Zara is particularly a strong competitor because of its focus and specialization in women's wear in the market. Moreover, both companies are sufficiently large, with H&M having reached at least 74 countries selling clothing for men, women and children (RetailDetail 2020).

Both companies have a long history and well-developed reputation and strong brand image in the market.

3.3 PESTEL analysis

The macro-environment analysis carried through PESTEL is aimed at providing an understanding of the market to help inform HR decisions for Uniqlo.

3.3.1 Political/legal environment

India is a relatively politically stable country despite recent political turbulence characterized by differences and conflict with neighbors such as Pakistan. India is regarded largest democracy in the world. This creates a politically stable environment for businesses to thrive. However, corruption has become quite a challenge in the political circles and affects the ability of businesses to operate efficiently. In the recent past, India

established regulations affecting foreign companies. For instance, foreign investors, especially from countries sharing a border with India, must seek direct approval from the government. The government of India sets regulations for human resources, such as the minimum wage act, working conditions code and social security codes. For instance, the regulatory measure dictates that firms with more than 20 employees are obligated to announce their vacancies online (Prakash and Murthy 2022).

3.3.2 economic environment

India registered a Gross National Product (GNP) of US $2,625.44B in 2020, which is a slight decline from the previous year, considering the impact of the COVID- 19 pandemic on the global supply chain. India registered an 8.62 percent decline in 2020 GDP of $2,622.98B from the previous year. However, the GDP growth rate of the country has gradually declined in the last half a decade. Unemployment rates in India are quite high such that as of March 2022, the statistics depicted 7.8 percent. India has in the recent past registered an increasing disposal income, with the highest rate registered in 2020 standing at 1797.76 US dollars (The Economic Times 2022). However, projects suggest that the country will experience a 6.7 percent inflation in9.

3.3.3 social environment

The Indian constitution recognizes 23 official languages, with the Hindi language widely spoken and English serving as a subsidiary official language. Many people in India adopt the use of the Devanagari script. As opposed to the misconception by many people, Hindi is not a widely spoken language in India, considering that 56 percent of the population speaks a different language other than Hindi. Another cultural element of note is the religion in which 84 percent of people in the country identify with the Hindu religion, 14 percent are Muslims, while Christians Sikh account for 2.3 percent and 1.7 percent, respectively (Khan 2019). In the recent past, cases of religious intolerance targeting Muslims and Christians have been reported, with 527 cases of hate crimes reported in 2019 (Licas 2020). In terms of age distribution, a majority of the Indian population, 67.27 percent, are aged between 15 and 64 years and this group forms the bulk of the workable population.

3.3.4 technological environment

India is currently at position 48 in the innovative global index of 2021 because of its deliberate huge and sustained investment into technological infrastructure (Global innovative index, 2020). There is a gap in India, especially when it comes to the supply of the technologically skilled and trained workforce in the market. However, many players in the apparel industry in India employ the use of HR technologies to carry out recruitment and selection processes based on the huge applications they receive. In terms of internet stability, India is ranked at position 70 out of 180 countries on a comparison of median fixed broadband speed and 115 positions out of 138 countries when the comparison is carried out based on median mobile internet speed (Thakur 2022).

3.3.5 environmental factors

India is concerned with different forms of pollution that may affect the quality of its environment. Thus, the environment protection law of 1980 and the water prevention and control of pollution act of 1974 apply directly to the clothing industry as there are concerns that the textile industry is among the leading environmental pollutants in the country.

3.4 Why go there?

Expansion into the city of Mumbai is informed by the availability of labor and the market for Uniqlo products. The rich diversity in the city, considering that it is an alpha city, also increases the possibility of recruiting not only the Indians but also people from all over the globe. The unemployment rates, together with relatively low consumer disposal income, also mean that the labor in the Indian city will be relatively cheaper than in Japan. The relatively stable and accessible internet connection also creates an opportunity for HR technologies. However, the concern in the market comes from rich Indian traditions and culture, as well as religious intolerance, which might affect human resource activities such as recruitment. Uniqlo's weakness going into the market in India will face great challenge based on its policies that greatly favor a nationalist approach, considering that it largely depict and the Japanese even in its HR practices.

4. HR THEORIES

Uniqlo's success in Mumbai city needs to embody a contingency approach in order to register improved organizational performance. A contingency approach is concerned more with the consideration of the prevailing situation in the market to inform the management behavior of the organization (Vidal et al. 2017). In other words, Uniqlo needs to consider human resource practices based on market dynamics. The contingency approach will help Uniqlo to fit into the Mumbai market because of the differences in culture between the host country and the parent country.

First, Uniqlo will be assured of better organizational performance when it considers skills and training levels in Mumbai and offers appropriate training and development to help boost the capacity of the workforce depending on the gaps experienced. This is informed by the fact that where the level of technological expertise in the Indian market is relatively low, it might need to assess Uniqlo's HR team to gauge the capability in

the market to inform proper training and development processes to guarantee improved performance. This will be unique to the Indian market rather than making it an organizational culture.

Secondly, social and cultural practices in India seem unconducive to outsiders because of the traditional approach that sees native languages and religions thriving. The cases of intolerance based on religious beliefs mean that Uniqlo is quite limited in terms of recruitment approaches. Thus, based on the prevailing scenario in the host country, it will be important that Uniqlo adopts a polycentric recruitment method. However, the difference in cultural practices between the host country and the parent country and the desire of Uniqlo to retain its brand and core competencies in the market, recruitment and selection processes polycentric strategy. The use of the polycentric recruitment method will be aided by the fact that India has relatively stable internet connectivity that will support HR technologies such as the virtual recruitment process. Moreover, the fact that Mumbai is an alpha city also means that people from all backgrounds reside there and therefore, the right candidate can be sourced.

5. HRM PRACTICES

Uniqlo's quest to achieve better organizational performance hinges on key human resource practices such as recruitment and selection, training and development and HR technology.

5.1 Recruitment and selection

Recruitment entails searching and obtaining potential job candidates who will fill vacancies in the firm. Selection involves evaluating and deciding who is the best fit for the available job position. Recruitment and selection processes are very important since they ensure that the organization has the needed skills to fulfill different operations. The staffing approach best fitting Uniqlo in Mumbai is the polycentric approach. A polycentric approach entails filling up positions by natives in the host country, in this case, India. The high level of intolerance along religious lines, the possibility of the language barrier and high unemployment rates in the country might make the place unconducive for foreign nationals to guarantee better organizational performance. Moreover, India also has a large workforce based on its high population, with Mumbai only serving as home to 22 million people (Macro Trend 2022). The largest population dimension entails people aged between 15 and 64 years old, which is the employable workforce. Uniqlo needs to consider a contingency approach when it comes to the recruitment and selection of employees. The first consideration should be Parent-country nationals, especially at key

management levels within the organization. The decision is influenced by India and Japan's different cultural practices, with Uniqlo's core competencies anchored on Japanese culture. It is only through parent-country nationals that it will maintain organizational performance. However, the bulk of the workforce needs to come from host-country nationals based on the availability of labor in the Indian market. The high rate of unemployment in India and lower disposable income also mean the labor in the market will be cheaper. Moreover, the availability of stable internet connection means that recruitment practices can be done online where advertisement and recruitment process done online to allow the company to attract huge applicants to increase the chances of tapping the best brains in the market.

5.2 Training and development

As demonstrated above, the labor force in the Indian market will need some training and development in order to align with Uniqlo's organizational culture and, therefore, guarantee effective organizational performance. The use of ADDIE will be helpful to Uniqlo in training its employees.

5.2.1 analysis

As Uniqlo seeks to move into the Indian market, training will be necessary for both host-country nationals and parent-country nationals to help them fit into the work environment and guarantee expected organizational performance. Training will be critical in addressing the existing gaps in the human workforce's capability and capacity. While it is expected that host-country nationals will have knowledge of the organizational culture, the differences in core competencies of Uniqlo are expressed by its insistence on Japanese tradition. This means that gap exists among host-country nationals; therefore, it comes in the form of a lack of knowledge of organizational culture as well as a lack of technological know-how. Secondly, the parent-country national will also have a gap in the knowledge of the host culture that will help them fit into the unique cultural environment in the host country. Therefore, the best way to address these concerns would be through training. First, for the host-country nationals, induction training will be necessary to introduce them to Uniqlo's culture, structure, and organization to help contribute to better organizational performance. In the same way, aware of the technological knowledge limitation in the market, job training with the aim of increasing the knowledge of the host-country nationals. However, expatriate cultural awareness training will be handy for parent-country nationals to prepare them for roles in the host country.

5.2.2 Design

Table 1: Learning objectives

Timeline	1-3 months	3-6 months	6-12 months	1-2 years	Over 2 years
Induction training	Acquaint new employees with the organization's culture and environment	Develop a sense of belonging	Maintain a healthy relationship with colleagues		
Job training	Provide job-related knowledge and skills	Influence change of attitude of workers	Improv efficiency of workers	Improve productivity of workers	
Cultural awareness	Familiarity with the host culture	Learn native language	Familiarity with host country environment		

5.2.3 develop the training program

In developing the training program, the primary consideration for Uniqlo would be to focus on the participation of trainees to carry them along and encourage their participation. The Indian society has a near balance of collectivist and individualistic attributes that will inform the nature of training. While it is important to give direction to those in training, it is also important to allow them the freedom to participate in the learning process. Secondly, relevance will also be important because appropriate knowledge will help employees to fit in their environment and discharge their duties effectively.

5.2.4 implementation

Uniqlo will be successful in guaranteed organizational performance through the training processes in ensuring the training materials are availed. The key considerations should include a clearly defined learning outcome, method of delivery, whether online or physical and the testing procedure to evaluate mastery of content. 15

5.3 HUMAN RESOURCES TECHNOLOGY

Technology is an integral element in human resources as it impacts organizational performance. HR technology can help in better management of human resources. As Uniqlo seeks to expand into the Indian market, it seeks to bank on relatively stable internet connectivity for mobile broadband and fixed broadband internet speed. One of the primary functions that HR technology will help Uniqlo properly manage the human resource in Mumbai will the talent acquisition. The fact that Uniqlo will be seeking to recruit employees from the native market means that HR technology will help in sieving through thousands of applications and guarantee the selection of the best and most talented individuals into the workforce. For instance, e-recruitment is particularly important because it allows for an expedited hiring process, thus saving time and resources. Moreover, the efficiency brought

about the e-recruitment will particularly allow Uniqlo to immediately impact the Mumbai market as it will reduce biases that might come with physical recruitment.

6. IMPACTS OF HRM PRACTICES

Human management practices have a significant impact on human resources and the organization at large.

6.1 Organizational performance

The use of a mixed staffing approach will ensure that Uniqlo is equipped with the best people to carry out its operations in India. It will help appeal to the local market and ensure the organization maintains its core competencies. Thus, the organizational performance will be experienced in the form of market performance where Uniqlo will gain improved market share in Mumbai. Employees' training and development will also improve organizational performance since all employees will have the required knowledge and skills to perform their different roles. Furthermore, the use of HR technology will ensure market performance as the system will allow Uniqlo to tap into the best talents in the market, which will help in driving sales and capturing the market. Arguably, the objective of any company entering Uniqlo when entering a new market is to capture the market and gain market share.

7. RECOMMENDATIONS

Having analyzed the HRM practices for Uniqlo in the Indian city of Mumbai. Thus, the following recommendations will be worthy for Uniqlo's HR director to consider.

First, on the aspect of training and development, the director needs to consider deeply training in cultural awareness for its employees both from the host-national country and parent-national country to make them prepared for the work environment. This is informed by reported social intolerance in India and also varied cultural differences between the host and parent countries.

Secondly, on HR technology, the HR director

needs to fully take advantage of the reasonably stable internet access, connectivity and skills to carry out a wide range of human resources activities, including recruitment processes, because of its efficiency and low cost.

The HR director might also consider a mix of the polycentric and ethnocentric international recruitment process in order to strike a balance between maintaining the organizational culture while also appealing to the domestic market.

8. CONCLUSION

India forms a good prospect for Uniqlo. The high population will provide an effective market and labor for the company. The favorable legal, economic, social, technological, and political environment will make it easy for Uniqlo to excel in the country. The company should adopt an appropriate approach to staffing, training and developing its employees and have effective reward systems to motivate them. However, the concern over some elements of social intolerance and the difference in culture between the host and parent country means that Uniqlo will need to employ the use of HR technology to carry out recruit staff from the native market while also keeping elements of the parent country nationals into the company.

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Application of Virtual Simulation Training Platform in the Teaching of Art Ancient Architecture

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Abstract: The teaching of art ancient architecture is an important part of cultivating students' artistic accomplishment and architectural design ability. However, there are many problems in the traditional teaching methods, such as limited space, high cost and limited practical opportunities. To solve these problems, virtual simulation training platform came into being. The virtual simulation training platform uses advanced technology to simulate real ancient architecture scenes and provides interactive learning experience for students. In view of this, based on the characteristics and advantages of the virtual simulation practical training platform, the application value of the virtual simulation practical training platform in the teaching of art ancient architecture is deeply analyzed, and the specific application of the virtual simulation practical training platform in teaching is discussed on the basis of mastering the current situation and requirements of ancient architecture teaching.

Keywords: Virtual Simulation Training Platform; Art Class; Ancient Architecture Teaching; Apply

In the teaching of art ancient architecture, the application of virtual simulation training platform can provide a rich variety of scenes for students to learn and practice.At the same time, the sharing and interaction of teaching resources can be realized to improve the teaching effect. Students can practice repeatedly through the virtual simulation training platform, reduce errors and losses, and improve learning efficiency.Therefore, in order to improve the effectiveness of ancient architecture teaching, we should actively apply the virtual simulation training platform, strengthen technology research and development, and improve the reality and interaction of the virtual simulation training platform.

1. VIRTUAL SIMULATION TRAINING PLATFORM

Virtual simulation training platform is an educational tool based on computer technology, which aims to simulate the real environment and provide opportunities for students to practice and experiment.Through the use of virtual reality technology, the platform creates various scenarios and situations, so that students can practice in a controlled and safe environment, and get real-time feedback and guidance.The virtual simulation training platform can be applied in education and training in various fields. Students can perform operation simulation through the virtual platform to improve their skills and level [1].For example, in the field of engineering, students can carry out architectural design, mechanical processing and other practices in a virtual environment to familiarize themselves with operational processes and specifications in advance.At the same time, the platform can provide personalized guidance and feedback based on student performance and needs to help students continuously improve and improve.The platform also has the characteristics of low cost, flexible time and reusable resources, which can be used in various teaching environments, contributing to the improvement of teaching efficiency and quality.

2. TEACHING METHODS OF TRADITIONAL ART ANCIENT ARCHITECTURE

In the teaching of art ancient architecture, there are two widely used ways, one is ethics teaching;The second is to organize students to study and investigate ancient architecture.As for the classroom teaching method, it is a relatively comprehensive and systematic teaching method, which explains time as a series, helps students connect the whole knowledge system, and enables students to have a deep understanding of the historical evolution of ancient buildings in a short time, so as to achieve the purpose of systematic teaching.However, in the process of application, this method emphasizes the explanation of theoretical knowledge and ignores the historical, cultural and philosophical background behind it, resulting in students' one-sided and superficial understanding of ancient architecture [2].Moreover, from the perspective of students' experience, the whole teaching process is boring and lacks interest and interaction in form. In addition, in terms of content presentation, the intuitive experience of three-dimensional architectural space is not strong, and the combination with modern society is lacking. After learning ancient architectural skills, students can hardly apply them to modern architectural design and practice, and there are limitations in learning.The way of field investigation is to organize students to go to the extracurricular field investigation or surveying and mapping practice, which is a more intuitive learning mode.Through the combination of field visits and teaching and explanation of ancient buildings, students can feel the charm of architecture.This way is more

intuitive than classroom teaching, can show the characteristics of the building, and is conducive to the enhancement of students' learning initiative.However, although field research makes up for the direct limitations of classroom teaching, it is difficult to carry out frequent field research because of time, cost, building shape, security risks and other factors, and it is difficult to help students truly master skills and techniques.

3. THE APPLICATION VALUE OF VIRTUAL SIMULATION TRAINING PLATFORM IN THE TEACHING OF ART ANCIENT ARCHITECTURE

In view of the various drawbacks existing in the teaching of art ancient architecture, the virtual simulation training platform can be applied to promote the improvement of teaching efficiency and quality [3].With the help of virtual simulation training platform, students can practice without actual ancient buildings, providing students with a real architectural environment, allowing students to feel the characteristics and atmosphere of ancient buildings in a realistic situation, and quickly understand and master the artistic characteristics of ancient buildings.The simulation training platform can provide students with a wealth of ancient buildings, cases and materials for research and study. Students can view various models and pictures of ancient buildings through the platform to understand the historical background, architectural structure and decorative style of buildings, so as to broaden students' knowledge and cultivate students' ability of art appreciation.

The application of virtual simulation training platform to the teaching of art ancient architecture can provide students with interactive learning experience. Students interact with virtual architecture through the platform, including observing architectural details and adjusting architectural structures, so as to have a deep understanding of the construction process and design principles of ancient architecture.This interactive experience can stimulate students' learning interest and creativity, and cultivate students' practical ability and problem-solving ability [4].The scientific application of the virtual simulation training platform can also provide flexible learning time and place. Students can enter the virtual simulation training platform at any time and any place through the network to learn, without being limited by time and space. This flexible way can allow students to arrange their learning time scientifically and promote the improvement of students' learning efficiency.

4. THE SPECIFIC APPLICATION OF VIRTUAL SIMULATION TRAINING PLATFORM IN THE TEACHING OF ART ANCIENT ARCHITECTURE

The virtual simulation experiment software of ancient architecture cognition and construction based on the htc vive interactive mode can build a real and immersive interactive environment with the help of virtual simulation technology, allowing students to feel the ancient architecture structure as the center and deepen their understanding and impression of the knowledge related to ancient architecture through interactive operation such as helmet and handle.Promote the improvement of teaching effect [5].In the application process, the virtual simulation training platform contains many levels, such as data layer, functional logic layer, virtual interactive support layer, etc. Each level has powerful functions, which can provide support for the diversified development of teaching activities.

4.1 Data layer

In the teaching process of art ancient architecture, through the application of virtual simulation training platform, it can provide students with massive data information and provide support for students' in-depth learning with the help of the data layer.The virtual simulation training platform can provide detailed data of ancient building materials, including the characteristics, uses and treatment methods of stone, wood, brick and other materials. Through the virtual platform, students can understand the characteristics of different materials and learn how to correctly select and use these materials.With the help of the platform, students can learn the structural characteristics of ancient buildings and master the structural types, construction methods and supporting principles of different ancient buildings.The platform can provide specific structural data and diagrams to help students quickly understand and simulate the structure of ancient buildings.In the data layer, data of ancient buildings of different styles are covered, including architectural styles of different periods and regions such as Song Dynasty and Ming Dynasty. Students can observe and compare ancient buildings of different styles through the platform, understand their characteristics and evolution process, and cultivate their aesthetic and appreciation ability of ancient buildings [6].There are abundant historical data of ancient buildings in the data layer, including architectural background, historical background, builder information, etc. Through the platform learning, students can master the historical background and cultural connotation of buildings, clarify the status and influence of ancient buildings in history, and improve students' cognition and understanding of ancient buildings.In addition, relevant data on the restoration of ancient buildings are provided, such as restoration principles, restoration methods and restoration cases, etc. During the learning process of the platform, students can learn theoretical knowledge and practical skills of the restoration of ancient buildings, realize the importance and difficulties of the restoration of ancient buildings, cultivate students' awareness of the protection of ancient buildings, and promote the improvement of students' comprehensive ability.

4.2 Functional logic layer

In the virtual simulation training platform, the functional logic layer can play the role of data processing. In the functional logic layer, unity 3D professional development tools are used as the carrier to process and process all kinds of information in the data layer and build the corresponding data model of ancient buildings. Then, according to the teaching requirements and characteristics, functional support software is developed and designed for the hardware equipment of the system, including VR head-mounted display, handle, positioner, etc.Truly realize the human-computer interaction of virtual simulation, make the virtual simulation of ancient buildings more intuitive and three-dimensional in terms of presentation, provide convenience for students' learning, deepen students' knowledge and understanding of ancient buildings, and ensure that students can understand ancient buildings.There are two learning modes in the functional logic layer, namely learning mode and assessment mode.Among them, the role of learning mode is to help students master knowledge related to ancient architecture,

provide students with a platform for practical operation, students can build ancient architecture on the platform, consolidate the knowledge in practice, and improve students' ability and level.The platform supports multiple online learning at the same time, and students can communicate and collaborate with other students in real time through the platform, promoting exchanges and cooperation between students and improving learning results.The function of the assessment model is to assess the degree of students' mastery of ancient architecture knowledge and skills.For example, the platform can design some virtual practical training projects, requiring students to design and build according to the requirements of ancient buildings, so as to evaluate students' design ability and practical operation ability.The platform can also provide online tests and examinations to test students' grasp of the theoretical knowledge of ancient architecture. The specific knowledge points are shown in Table 1. Through the assessment, teachers can understand the students' learning situation in time and provide targeted guidance and help for students.

Table 1 Knowledge points of ancient architecture teaching assessment

Serial number	Knowledge point name	primary coverage
1	The basic elements of the ancient cities	Governing institutions, all kinds of zoning, such as manual areas, residential areas, etc
2	The main constituent characteristics of the ancient urban space	Founder, grid, closed, etc
3	Ancient architecture system	Materials and construction methods; layout;
4	Artistic expression mode of ancient architecture	The psychological schema and environmental coordination of the location of ancient buildings; the construction purpose of building space and the means of rendering effect
5	ecclesiastical building	Layout, characteristics, etc
6	Official offices and ceremonial buildings	County street location; Confucian Temple layout; shape features of Dacheng Hall

4.3 Virtual eyes and operating handles

During the operation, students can realize the first-person vision through the glasses, have a comprehensive understanding of the ancient buildings, enjoy the construction process, and make the virtual environment more real.Students wear helmets, immerse themselves in the virtual scene, and recognize and build building components through program Settings, so that students can be immersive, enhance the sense of experience, stimulate students' interest in learning, help students get different feelings, and deepen students' memory and understanding of knowledge.The left handle can generate fishing line by pulling the trigger, and move instantly by releasing the trigger. As a menu for the realization of system functions, it is surrounded around the left handle in the form of function panels. Different functional options are set on the panels, and component models can be picked up from the models in different constructed

scenes through the selection and adjustment of relevant environmental modes.There are several functional panels that can be selected from the control operation lever:

Select the scene panel.On the basis of mastering the overall structure of ancient buildings, it provides diversified construction scenes.In these scenes, students can observe and learn the characteristics, structure, design and decoration of ancient buildings and other aspects of knowledge, freely browse the scene, observe every detail of ancient buildings.In the process of selecting the scene panels of ancient buildings, the process of simulating the construction of ancient buildings is generally taken as the basis, and scenes such as roofs, columns, and walls are provided in the order of top to bottom.If the provided scenes do not meet the actual requirements, you can flexibly set the scenes of ancient buildings in a custom way.

Mode Control panel.After entering the virtual

construction scene of ancient buildings, you can enter the interior of the scene.Usually, the ratio of platform mode is 1:1, and students can build ancient buildings according to requirements.In order to promote the construction of ancient buildings and improve the learning efficiency, the simulation control panel can also provide other scale modes, such as 1:5, 1:10 and 1:20. In the actual operation, students can pull the scale bar with their right hand to customize the scale mode and enhance the experience of ancient building construction.At the same time, through simulation operations, students can understand the functions of different parts of ancient buildings, such as opening, closing, rotating doors and Windows, or try different materials, colors, textures, and different architectural styles and structural forms.Through practical operation, students can understand the design principles and aesthetic standards of ancient buildings, and improve their design ability and creation level.

Environment control panel.After a period of operation, students can use the environmental control panel to help students deeply understand the environmental characteristics and design principles of ancient buildings.By adjusting the light, students can simulate the sunshine in different time periods and observe the influence of light on the shape and material of ancient buildings.By adjusting the climate and temperature, students can simulate the climate conditions in different seasons and understand the adaptability and protection measures of ancient buildings in different climates.The environmental control panel can also provide some special functions, such as simulating the influence of natural factors such as rain and wind on ancient buildings. Students can observe the reaction and change of ancient buildings under different natural conditions by adjusting various parameters.

Component search panel.Because the structure of ancient buildings is more complex, during the specific construction, there are many building component models involved, and relevant models are difficult to be fully displayed in the interface, so it is necessary to find the required components through the component search panel.Through this function, students can search for different ancient architectural components and use them flexibly.At the same time, use the handle to search and turn the page up and down. After finding the required ancient building component, drag it out of the interface through the form of drag, normal construction and use operation, and click the ancient

building component again, the component will display the corresponding attribute information.

4.4 Virtual interactive support layer

The virtual interactive support layer can provide real interactive experience and support functions to help students better understand and master the knowledge and skills of ancient architecture.Through the application of the virtual interactive support layer, students can practice in the virtual environment and improve their practical ability and innovation ability.In this level, a real ancient architecture practice environment can be created, and students can carry out various practical operations in the virtual environment, including construction, decoration, design, etc.Through virtual practice, students can quickly understand the structure and characteristics of ancient buildings and improve their practical ability.With the help of the virtual interaction function, the interactive brush and simulation editor can be used for painting and modeling operations, so as to achieve reasonable operation and improvement of ancient buildings.

Virtual simulation is a training platform, and the construction of ancient buildings and environmental simulation should be supported by corresponding software and hardware.In terms of software, during the design and development process of the platform, virtual simulation development tools such as unity 3D can be used to download and use directly on the official website.In terms of software, the use of VR head-mounted display, handle and other related equipment can be purchased by itself, many VR head-mounted displays are integrated with positioner and corresponding handle, so when buying a display, you do not need to buy another positioner and handle.During the actual operation, there are big differences between different VR head-mounted displays, so the application should be properly adjusted according to the specific characteristics of the display before application, to ensure that it can be reasonably used in the platform, so that the teaching of ancient architecture can be smoothly carried out and the expected effect can be achieved.After entering this level, students can use VR technology to achieve interaction, and walk around according to the arrow route displayed on the ground, so that students can have a general understanding of the overall space scene. The walking path is the same as the walking path in 360 video, as shown in Figure 1.
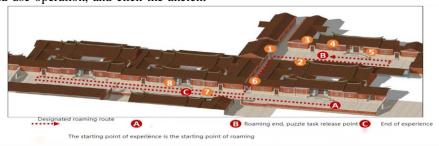

Figure 1 A roaming diagram of an ancient building

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Roaming process, there will be dubbing of ancient overall introduction, when the students reached the end of the roaming path, will trigger instructions, guide students to collect the puzzle fragments in the scene, walk in each scene, location and the corresponding knowledge content, let the students carefully observe all parts of the puzzle, click the puzzle will pop up text and pictures, specific as shown in figure 2, synchronous voice interpretation, students finish point, hit OK can close the window.

（a）Ground arrows guide the roaming route
（b）Puzzle and description pop-up window after clicking

Figure 2 Effect diagram of the virtual interaction scene

4.5 Application examples

In order to verify the application effect of the virtual simulation training platform in the teaching of art ancient architecture, the practical application of the virtual simulation training platform was analyzed by taking the Beijing Haidian Spring Temple with no ruins, the Beijing Xiangshan Jingming Garden Water Spring Courtyard with well-preserved ruins and the Shenyang Palace Museum with well-preserved buildings as examples.

On the basis of a full grasp of the status quo of ancient buildings, relevant technologies are learned and optimized according to different preservation conditions, opening states, building types, etc. At the same time, corresponding software is lent to build real 3D and virtual 3D models of various types of historical buildings for spatial immersion experience, and the behaviors and activities in the buildings are truly restored.In addition, the design concept, construction practice and material application of ancient buildings are taken as display modules to present them in an all-round way in the form of expanded links, so that ancient buildings can not only experience the spatial effect and the overall picture of the building, but also effectively connect the relevant historical value and heritage protection knowledge with the application platform of virtual teaching.

In the specific operation process, it can be combined with the preservation of ancient buildings such as sites that are not existing, sites that are still existing, and buildings that are still existing, and based on the different characteristics of virtual simulation technology means, the architectural scene can be intuitively displayed.At the same time, VR, AR and other technologies are used to connect with teaching practice.If VR is applied to virtual three-dimensional display of Quanzong Temple, the display degree is high, the Angle selection is flexible, and the overall appearance can be presented through bird's eye view and other vision, but the modeling is difficult and the requirements for architectural information and details

are high, as shown in Figure 3.

Building bird 's-eye view virtual simulation model

Building group virtual simulation model

Building yard virtual simulation model

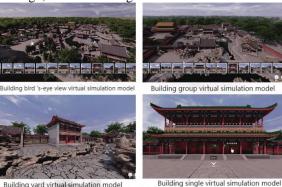Building single virtual simulation model

Figure 3 Display diagram of the virtual 3 D model of Quanzong Temple

In the process of three-dimensional superposition of the real scene of Shuiquan Courtyard by means of AR, the ancient architectural groups that do not exist but the ruins are well preserved can be visually displayed. During the teaching practice, two ways are adopted to present the plane drawing and the real environment.The plane drawing presents a good overall sense, a comprehensive Angle, and a good sense of immersion in the real environment, which is more intuitive. However, compared with VR technology means, the construction cost of this technology is high, as shown in Figure 4.

Present situation of Shuiquanyuan site

Building original appearance information model

Heart wash pavilion and environment
Building restoration model display

Architecture lap video demonstration

Figure 4 AR virtual display of heart Pavilion of Shuiquan Courtyard

Using photographic modeling to display Shenyang Palace Museum in 3D, the 3D real scene has strong authenticity and intuitivity, good immersion experience of the scene and richer details, but the display Angle is limited, as shown in Figure 5.

Figure 5 Three-dimensional display of photographic modeling of Shenyang Imperial Palace

While using different ways to show the features of ancient buildings, it is also necessary to reflect the artistic, historical and cultural values carried by historical buildings. Through pictures, audio and video interaction, knowledge points are linked and expanded to effectively connect with teaching and improve teaching quality and efficiency.

5. CONCLUDING REMARKS

To sum up, in the teaching of art ancient architecture, the reasonable application of virtual simulation training platform can provide real architectural environment, rich cases and materials, interactive learning experience and flexible learning time and place, help students better understand and master the artistic characteristics of ancient architecture, and improve students' practical ability and creativity.Therefore, in order to ensure the smooth progress of teaching work and improve the quality and effect of teaching, we should recognize the importance of virtual simulation training platform in teaching and reasonably formulate application countermeasures.

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Cultural Trauma Construction and Collective Memory Representation in Petals of Blood

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Abstract: Kenyan English literature writer Ngugi wa Thiong'o portrays in his novels the long-standing colonial oppression and racial discrimination suffered by his own people, vividly depicting the painful history of Kenyan society under imperial colonization and the threats brought about by neocolonialism after independence. As a native African writer, Ngugi retraces the collective memory of Kenyan people using the imperial language, enabling the previously "invisible" colonial society in a Western-centric context to voice its grievances against the colonial invasion of politics, military, and economics. This allows the blood-stained reality of colonial society to be publicly proclaimed through mass media and successfully constructs a national cultural trauma. This article will analyze the representation of collective memory in the novel Petals of Blood and its role in the construction of Kenyan national cultural trauma using cultural trauma theory.

Keywords: Ngugi wa Thiong'o, Petals of Blood, Collective Memory, Cultural Trauma

1. INTRODUCTION

Ngugi wa Thiong'o is a Kenyan novelist who has been nominated for the Nobel Prize in Literature multiple times and is a popular contender for the award. As a patriotic intellectual and revolutionary in a former colony, he, like other Kenyan people, feels shame and resentment over the decades-long colonial rule in their homeland. After the famous Mau Mau uprising, Kenya gained its independence as a nation. However, escaping imperialistic domination did not heal the trauma that Kenyan people had endured under colonialism, and the arrival of neocolonialism continued to subject the entire nation to oppression and inequality. Unlike old colonialism, which used its political power and brute military force to invade and rule third-world countries, neocolonialism cultivated proxies within these nations and, through capital support, allowed so-called national capitalists and bureaucratic capitalism to gradually control the national economy, extending control over economic, diplomatic, and cultural sectors of the colonial society. In Petals of Blood, a once primitive, closed, but peaceful village of Ilmorog is transformed overnight into a globalized, open, yet decadent city, thanks to the influence of neocolonial forces. Ngugi, through the perspective of the village undergoing gradual transformation, fully exposes the invasion of the continent by colonizers. In his view, there is no essential difference between neocolonial big landlords, capitalists, and the original white executioners who first set foot on African soil. The village's fate is a reenactment of colonial actions. The characters in the novel are closely linked to the village, serving as carriers of its memory and symbols of the entire Kenyan nation. The four main characters come from diverse backgrounds, representing their class ideologies, and they also embody the nation's memory. They gather in the village to escape and heal from their past traumatic experiences, but urbanization of the village robs them of their spiritual sanctuary, leading to even deeper trauma. Ngugi gradually reveals the national trauma through his portrayal of the characters' psychological wounds, aiming to construct a national cultural trauma.

2. CULTURAL TRAUMA CONSTRUCTION THEORY

Sociologist Jeffrey C. Alexander describes cultural trauma as, "When collective members feel they have suffered a dreadful event that leaves an indelible mark on their collective consciousness and memory, and irreparably alters their future, cultural trauma occurs." Therefore, in contrast to previous physiological and medical-based naturalistic trauma theories, which view trauma as a deprivation and destruction of people's psychological well-being caused by an event, Alexander's cultural trauma theory focuses on the process of narrating, representing, and constructing historical events, rather than describing the events themselves. "An event is one thing, its representation is another."[1] Alexander approaches historical events with a certain degree of skepticism, emphasizing the ambiguity of traumatic events due to different discourse subjects. He asserts that the attribution of a certain event as traumatic is dependent on its public attributes and societal descriptions of the event. If these two conditions are met, cultural trauma can be constructed. However, the author believes that Alexander's emphasis on societal discourse has limitations.

One limitation lies in his view of societal discourse. In an ideal society, everyone has a degree of freedom of speech, and collective voices collectively contribute to the societal discourse. However, in a neocolonial society, agents of imperialism have more power and influence than the old colonial white rulers. They exploit surplus value from ordinary workers through brutal means while evading criticism and resistance from within imperialism, such as the strong critique of

capitalism by Marxism. The voices of ordinary people are marginalized, and societal discourse is effectively controlled by capitalists and the neocolonial government. In the novel, the local newspapers refer to the exploiters of the people's labor as "great educators" and "saviors of Ilmorog." It's not difficult to imagine how this glorification of the ruling class in discourse blocks the channels for ordinary people to speak out and misleads the colonial people, preventing them from gaining a unified national identity. In such a context, the construction of cultural trauma remains theoretical, and the collective memory of Kenyan society is not made a shared trauma worth remembering.

Another limitation is Alexander's view that cultural trauma is constructed by societal media and is not necessarily based on actual events. However, this perspective seems to prioritize the construction process over the truth of the event. Some events that cause profound trauma may not have actually occurred, but the imaginative events constructed in the same way can still cause trauma. Scholar Sun Ke, in "Cultural Trauma Cognition and Its Value"[2], questions Alexander's statement and suggests that it places more emphasis on the construction of discourse, neglecting the reality of the event. On the other hand, Sun Ke suggests that Alexander's theoretical framework, rooted in the mature public space of the Western world, may be influenced by the distortion of the truth in institutional fields and the replacement of actual facts with fictitious events in political power operations. This influence could lead to the substitution of traumatic events with entirely fabricated facts, making trauma unconstructible.

Third, Alexander emphasizes the collective representation of trauma but overlooks the significant influence of individual memories on the construction of cultural trauma. "Cultural trauma and collective memory must be built on the foundation of personal memory. Without personal memory, there can be no spread and inheritance of collective memory, let alone the cultural construction of traumatic memory."[1] Scholar Chen Quanli questions Alexander's theory regarding cultural memory ethics. Therefore, to complete the construction of cultural trauma, it is necessary to analyze the collective memory of individual characters and their communities to elucidate the trauma of collective memory. Ngugi's aim in writing Petals of Blood was to construct a collective cultural trauma and identity for all Kenyan people, with the purpose of identifying the object of revolution and mobilizing the nation's strength to resist it. This aligns naturally with cultural trauma theory, even though the theory was not explicitly formulated when Ngugi wrote the novel.

3. SOCIAL MEDIA AND TRAUMA REPRODUCTION

As previously mentioned, Alexander's statements regarding the construction of cultural trauma in relation to public opinion and the media are not entirely clear. He believes that an event can only be recognized as a cultural trauma event when it gains recognition in the public domain and receives sustained support in public opinion. However, in many cases, the loss of the voice of the common people has not given scholars much opportunity to designate events as cultural trauma. During the development of capitalism, the authorities had already used the state machinery to control public opinion, and individual voices were disregarded as insignificant in the sea of so-called public opinion. In the novel, the experiences of the villagers in the urbanization process of the small village of Ilmorog are a good example. To develop the Ilmorog area, politicians and capitalists planned various land uses. They conspired with banks to provide loans to local farmers, deceiving the ignorant farmers into mortgaging their land. When the farmers couldn't repay the loans, their land was confiscated, and new factories and amusement parks were built. After the land that had been cultivated and inhabited by generations of farmers was taken away, they had no choice but to join the labor force, working for capitalists in factories for meager wages. Sociologist Neil J. Smelser stated, "A defining feature of social trauma is that the affected domain is the social structure of society."[1] The agricultural society, which was originally dominated by small-scale farming, was forced to become an industrial society dominated by capitalist production, and the process of change and its results were filled with blood and tears. However, the transformation of farmers into laborers was a silent one, and this collective trauma event did not receive much attention in the public opinion. If we only focus on public opinion controlled by capital, not only Ilmorog, but the entire nation of Kenya under such neocolonial aggression would have to endure in silence, and the construction of cultural trauma would never be successful. However, Ngugi anticipated this and understood that for the people to have a voice and express their dissatisfaction, they had to take the path of revolution. He arranged for one of the main characters, Karega, to experience a tumultuous life, making him resolute in his revolutionary ideals through numerous social experiences. Karega was expelled from school for participating in a strike, and subsequently worked various jobs, including street vending, teaching, and factory work. Through countless experiences, he gradually understood the essence of neocolonial exploitation and the true history of this country being invaded and trampled upon. He organized workers' strikes to seek their legitimate rights and persuaded more people to join the revolution. Karega's focus on the plot of the revolutionary struggle is precisely the path Enuguji envisioned for disseminating public opinion among the common people. He aimed to make the hardworking masses across the nation aware of the process of their country being invaded, and to inspire

them to resist the oppression of neocolonial forces. Mobilizing the power of the people to resist colonial actions and fostering collective identity and collective memory of the current state of national crisis laid a solid foundation for the successful construction of cultural trauma.

4. REVEALING HISTORICAL TRUTHS

Alexander's cultural trauma theory strongly advocates the virtual nature of the narrative and verbal construction of traumatic events. He emphasizes that trauma can occur before, during, and after an event, and even imaginary events can cause trauma. As mentioned earlier, this theory has not only made it difficult to construct trauma, but it may also lead to the manipulation of events' truth by powerful institutions for their own interests, creating a new illusion, making the truth an unknown hidden history. Such tactics are common in Western societies, and former colonies controlled by empires have had similar experiences. Ngugi keenly observed this tendency of historical void in Kenyan society and reflected it in Petals of Blood. The novel depicts a mysterious organization called the "Kamwene Cultural Organization", initiated by several local monopolistic capitalists and local district politicians, aimed at investigating the whereabouts of Mau Mau revolutionaries and launching strong attacks against them. The protagonist, Munira, was invited by the organization for a "tea meeting", but he witnessed the organization members' crackdown on Mau Mau members. He witnessed an underground party member confessing to his revolutionary actions and being beaten to the brink of death. Another protagonist, Wanja, working as a barmaid in a big city, was mistakenly identified as a Mau Mau member, and her residence was set on fire by the organization, putting her life in danger. All of these actions were suppressed by the authorities and through the power of the media, they remained largely unknown. Ngugi himself did not join the Mau Mau revolution, but his anti-imperialism, anti-colonialism, and pursuit of national independence made him closely related to the Mau Mau revolution. Official statistics reveal that during the four-year Mau Mau movement, tens of thousands of revolutionaries were killed, and hundreds of thousands were detained in concentration camps. In April 2011, the UK revealed the inside story of the repression of the Kenyan independence revolution, exposing the brutal persecution of Mau Mau revolutionaries by British colonialists, reaching an unimaginable level of cruelty. What is even more remarkable is that this was the first time in 50 years that the UK had disclosed the facts, as this information had been classified as top secret. Ngugi, as a supporter of the revolution, used his writing to record the cruel actions of colonialists against Mau Mau revolutionaries, using the fictional "tea" as a metaphor for the heinous acts of imperial colonialists against Kenyans, reviving the collective memory of this revolutionary history filled with bloodshed and trauma. The gruesome historical events are by no means figments of imagination, and the narration and construction of trauma depend on respect for historical truths. "The construction and imagination of cultural trauma cannot be carried out on a foundation of nothingness but must return to life experience"[1]. Despite the pressure from neocolonial forces in the country, Ngugi still bravely used literature to reveal the truth of this history, successfully constructing the cultural trauma of the Kenyan nation.

5. INDIVIDUAL MEMORY AND COLLECTIVE TRAUMA NARRATION

"Cultural trauma is first and foremost a threat to a culture, which may be identified by individuals within that society. In other words, cultural trauma poses a threat to some aspects of individual identity in that society. Therefore, if such a potential psychological trauma event cannot have a negative impact, it cannot be considered as a trauma"[1]. This statement is made by Neil J. Smelser in his essay "Psychic Trauma and Cultural Trauma". In comparison to Alexander, Smelser seems to have more concern for individuals and implies the positive role of individual psychological trauma in the construction of cultural trauma. In the novel Petals of Blood, Ngugi realizes this and subtly portrays the collective psychological trauma and real crisis shared by Kenyans at the beginning of their national independence.

The novel is written in the form of personal memoirs, and it is undeniable that it significantly influences the characterization of individuals. Munira, as the headmaster of the Ilmorog Primary School, is secluded in a remote and primitive place, detached from the world's affairs. As a member of the middle class, he cannot integrate into his wealthy landowning family of origin, nor can he align himself with the revolutionary comrades. He is repulsed by neocolonialism and cannot understand the revolutionary aspirations of the laboring masses. He is a typical representative of the middle class, and his numb psychology makes him out of place in society. As a representative of conservatism, he fears both sides of the revolution due to his resistance to change, which intensifies his identity crisis. Munira essentially represents the intellectual class in Kenyan society at the time, who possessed a vast amount of knowledge but were afraid of the revolutionary forces. Their traumatic memory is derived from the oppression of the new colonialists and their fear of formal changes.

The fate of the female protagonist, Wanja, is even more turbulent. She escapes from her autocratic and feudal family but ends up working as a lowly barmaid and prostitute in the city. Later, she comes to the small village to escape the life of abuse and becomes the owner of a brothel when urbanization arrives in the village. She repeatedly tries to save herself from the dark abyss, but each time, neocolonial society drags her back into it, subjecting her to a life of servitude and oppression. "We are all prostitutes,"[3] Karega says

after Munira mocks Wanja. The lower classes in neocolonial society have been deprived of their land and are subject to exploitation, just as prostitutes are stripped of their clothes and played with by others. This immense humiliation and subjugation are not only Wanja's wounds or women's wounds but the indelible memories of all Kenyan people. After being expelled from school, Karega sold wool and oranges by the roadside, a shameful episode he avoids discussing. He had once taught at the Ilmorog Primary School but was expelled due to Munira's jealousy. Later, through social experiences, he personally experienced the hardships of laborers, and his revolutionary consciousness began to awaken. He organized labor movements and joined the social revolution. He is the author's shadow in the novel, the embodiment of the author's revolutionary ideals.

Abdullah, a former Mau Mau member, was reported by an informant while carrying out an underground mission, resulting in the death of his comrades and the loss of one of his legs. He managed to escape but was forced into hiding in the remote Ilmorog until urbanization reached the village. Abdullah is both a participant in the Mau Mau revolution and a witness to the urbanization of Ilmorog. He represents the revolutionary fighters who resisted colonialism and the Kenyan people who cherished their homeland. However, the revolution was suppressed, and their cherished land was invaded by capitalism. Abdullah's trauma lies in his concern for the nation's fate.

In the novel, Ngugi arranges four main characters and gives them different life trajectories and experiences. This, in essence, illustrates that by understanding individual experiences of psychological trauma, we can metaphorically represent the traumatic nature of collective destiny and, in turn, reproduce the collective traumatic memory of the nation. The successful reproduction of this collective memory serves as a foundation for the construction of cultural trauma.

6. CONCLUSION

Petals of Blood is one of the most important works completed by Ngũgĩ wa Thiong'o in the 1970s. Although at the time, trauma theory was limited to the fields of psychology and medicine and had not yet received theoretical elaboration in the fields of literature and sociology, its creative purpose resonates with the cultural trauma theory put forth in the early 21st century by sociologist Jeffrey C. Alexander. That is, to reenact the collective traumatic memory of the Kenyan people who suffered the invasion of neocolonialism in their traditional society and to promote this trauma through the dissemination of the novel, implanting it in the hearts of contemporary and future Kenyan people, ultimately completing the construction of cultural trauma. The successful construction of cultural trauma will expand the suffering experienced by contemporary Kenyans who have been victimized into the memory of future generations who have not experienced it. Thus, the suffering under neocolonialism becomes a shared collective psychological trauma and experience for ancestors and descendants. The spark of revolution will be preserved and passed down for generations, and the revolutionary forces against neocolonialism and all forms of social injustice will endure. This is the greatest hope of Ngũgĩ wa Thiong'o, a patriotic intellectual for his homeland, Kenya.

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Analysis of Future Trends and Challenges in Investment Ratings

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Abstract: Investment rating plays a crucial role in the financial sector. This paper examines the development trends and challenges faced by investment rating. In terms of trends, advancements in technology and improved data availability have opened up new possibilities for rating methodologies. The application of machine learning and artificial intelligence has also introduced novel approaches and tools for rating purposes. However, challenges arise from issues related to data quality, privacy concerns, and the growing demand for model interpretability and transparency. To address these challenges, rating agencies must enhance data management and privacy protection, improve model interpretability, and collaborate with regulatory bodies and industry associations to establish standards and regulations. Looking ahead, rating agencies should actively explore new technologies, strengthen collaborations, and provide accurate and reliable rating services to foster a healthy development of the investment market.
Keywords: Investment Rating, Development Trends, Investment Rating Challenge

1. INTRODUCTION

Investment rating plays a crucial role in the financial industry by providing investors with assessments of the credit quality and risk levels of bonds, securities, and financial products. With the continuous development of financial markets and advancements in technology, the field of investment rating is facing new trends and challenges[1]. The improvements in technology and data availability offer new possibilities for ratings, while the application of machine learning and artificial intelligence brings new tools and methods. However, ratings also face challenges in terms of data quality, data privacy, model interpretability, and transparency. This paper aims to analyze the trends and challenges in investment rating, explore solutions and future directions, and promote the accuracy, reliability, and credibility of ratings to foster the healthy development of the investment market.

2. INVESTMENT RATING: DEFINITION AND SIGNIFICANCE

Investment rating refers to the process of evaluating and classifying financial instruments, companies, debts, or other investment entities to provide information regarding risks, credit quality, and expected returns. It plays a vital role in the financial market, aiming to assist investors in making informed investment decisions, facilitating the efficient functioning of capital markets, and providing a reference for credit risk management for financial institutions and debt issuers[1].

The significance of investment rating is multifaceted. Firstly, it offers an assessment of the credit quality and risk level of investment entities, enabling investors to comprehend the potential risks associated with their investments. Through ratings, investors can gain a better understanding of key indicators such as repayment capacity, profitability, and growth potential of the underlying assets or debts, enabling them to make more informed investment decisions.

Secondly, investment rating serves as a risk management tool for financial institutions. When extending loans or making investments, financial institutions need to evaluate the credit risk of borrowers or investment entities to determine whether to provide funding or undertake investments. Rating agency assessments assist financial institutions in accurately estimating risks, formulating corresponding risk management strategies, and reducing the likelihood of credit risk and asset defaults.

Moreover, investment rating is vital for the efficient operation of capital markets and investor protection. Rating outcomes provide investors with independent and professional credit assessments, enhancing market transparency, information symmetry, and investor confidence. The ratings also offer investors a standardized comparative tool, enabling them to evaluate risk and return differentials among various debts or investment instruments, facilitating wiser investment choices[2].

Furthermore, investment rating plays a crucial role in regulatory oversight. Regulatory authorities often rely on rating outcomes to determine capital requirements for financial institutions, restrict portfolio risk exposure, and formulate other regulatory policies. Rating results provide regulatory bodies with independent and objective credit risk evaluations, aiding them in effectively supervising the stability and healthy development of the financial system.

In conclusion, investment rating holds a significant definition and role in the financial market. It provides investors with vital information regarding credit quality and risk levels, aiding them in making informed investment decisions. For financial institutions, rating outcomes are essential tools for risk

management and credit risk control. Ratings also foster the efficient operation of capital markets and investor protection while providing valuable reference for regulatory authorities. Despite facing challenges, reforms and innovations can further enhance the accuracy and reliability of ratings, better serving the needs of the financial market and investors.

3. TRENDS IN INVESTMENT RATING DEVELOPMENT

3.1 Advancements in technology and data availability

With the continuous advancement of technology, the field of investment rating has experienced significant progress in technology and data availability. These advancements provide rating agencies and investors with more powerful tools and comprehensive data, thereby enhancing the accuracy and reliability of ratings.

3.1.1 application of big data and data science

The rise of big data technology has provided rating agencies with the ability to process and analyze vast amounts of data. Rating agencies can leverage big data technology to collect, integrate, and analyze data from various sources, including financial data, market data, industry data, social media data, and more[3]. By delving into and analyzing big data, rating agencies can gain a more comprehensive understanding of the operational status, market performance, and risk exposure of the entities being evaluated, thereby improving the accuracy and precision of ratings[4].

In addition, the development of data science has provided advanced analytical methods and technological tools for rating agencies. Through techniques such as machine learning, data mining, and pattern recognition, rating agencies can extract key information and patterns from large datasets to support rating decisions and risk prediction[5]. The application of data science not only improves the efficiency of ratings but also enables the discovery of new rating indicators and risk factors, providing a more comprehensive evaluation and predictive capability[6].

3.1.2 application of blockchain technology

The emergence of blockchain technology has brought increased transparency and data security to the field of rating. Through distributed ledgers and smart contracts, blockchain technology ensures the immutability and traceability of data. Rating agencies can utilize blockchain technology to ensure the transparency and verifiability of the rating process, reducing potential human interference and data tampering. Additionally, blockchain technology can improve data sharing and data privacy protection, enabling rating agencies to securely access and process sensitive data[7].

3.1.3 application of artificial intelligence

The application of artificial intelligence (AI) is increasingly prevalent in the field of rating. AI technology can automatically process and analyze large volumes of data and generate predictions and decisions by learning and simulating human thinking processes. Rating agencies can leverage AI algorithms

and models to automate the rating process, improving efficiency and consistency[8]. For example, AI can assist in automated financial analysis, text mining, and image recognition to extract key information and indicators from massive amounts of data, aiding in the assessment of credit quality and risk levels of entities.

3.1.4 sustainability ratings

Sustainability ratings have gained significant prominence in recent times as a crucial trend. With the growing significance of environmental, social, and governance (ESG) factors in investment decision-making, rating agencies are required to account for a company's sustainability performance and integrate it within the rating process[9]. This entails evaluating the company's environmental impact, social responsibility, and governance framework in order to provide comprehensive ratings and recommendations pertaining to its sustainability.

3.2 Application of machine learning and artificial intelligence in ratings

The advancements in machine learning and artificial intelligence technologies have introduced numerous innovations and improvements to investment ratings. These technologies enable the automatic analysis of extensive data and patterns, subsequently enhancing the accuracy and efficiency of rating models.

3.2.1 development of predictive models

Machine learning and artificial intelligence technologies can autonomously learn patterns and correlations from historical data, constructing predictive models that assess future risks and returns. Rating agencies can employ these models to forecast debt default probabilities, stock price trends, and economic growth patterns. Through the application of machine learning and artificial intelligence, rating agencies can more accurately evaluate the future performance and potential risks of investment targets, providing investors with invaluable information[10].

3.2.2 text mining and sentiment analysis

Rating agencies often encounter the need to analyze extensive textual data, such as company annual reports, news articles, and social media comments, to gain insights into a company's operational status and market environment[11]. Machine learning and natural language processing techniques can aid rating agencies in automatically extracting crucial information and discerning sentiment from textual data. By utilizing text mining and sentiment analysis, rating agencies can comprehensively understand the impact of market sentiment and investor sentiment on rated entities, facilitating more precise assessments of credit quality and risk levels.

3.2.3 risk warning and monitoring

Machine learning and artificial intelligence technologies can also be leveraged for risk warning and monitoring, enabling rating agencies to promptly identify potential risks and adverse signals. Through real-time monitoring and analysis of extensive data, rating agencies can establish risk warning models that

identify potential financial risks and market fluctuations, enabling the adoption of timely risk management measures. This real-time monitoring and warning system empower rating agencies to respond effectively to market changes and risk propagation, thereby enhancing the timeliness and sensitivity of ratings.

3.2.4 automation of the rating process

The application of machine learning and artificial intelligence technologies facilitates the automation and standardization of the rating process. Rating agencies can employ machine learning algorithms and models to automatically process and analyze extensive data, generating rating reports and outcomes. This automation of the rating process improves efficiency and consistency while reducing the impact of human errors and subjective judgments. Simultaneously, the automation of the rating process reduces costs and time for rating agencies, improving the scalability and accessibility of rating services.

In conclusion, the progress in technology and data availability, along with the application of machine learning and artificial intelligence, will significantly transform the approach and process of investment ratings. Rating agencies will be able to leverage more data, advanced analytical methods, and efficient rating models to provide accurate and reliable rating services. The development of these technologies will also foster innovation and competition within the rating industry, driving further enhancements and standardization of rating practices. However, as technology progresses, it is vital to address ethical and legal issues in the rating process to ensure fairness, transparency, and compliance.

4. CHALLENGES IN INVESTMENT RATINGS

4.1 Data quality and data privacy issues

Data quality and data privacy are two significant challenges in the investment rating process. Rating agencies rely on reliable and accurate data for assessment and prediction. However, the following data quality challenges exist in reality:

Incompleteness and missing data: Rating agencies may not have access to certain critical data, or the data may be incomplete or erroneous. This can lead to inaccuracies and distortions in the rating results[12].

Reliability of data sources: Rating agencies typically rely on multiple data sources, such as company financial statements, market data, industry reports, etc. However, there may be differences among different data sources, affecting the accuracy and consistency of the data.

Timeliness of data: Obtaining the latest data in a timely manner is crucial for accurate ratings. However, certain data may lag, and rating agencies may not be able to access the most up-to-date information, thereby impacting the accuracy of the rating results.

Data quality verification: Rating agencies need to validate the quality of data to ensure accuracy and reliability. However, data quality verification is a complex task that requires significant time and resources.

In addition, data privacy issues pose challenges in the rating process. Rating agencies handle a large volume of sensitive data, such as company financial information and personal identity information. Protecting the privacy and security of this data is a critical concern for rating agencies. They need to implement appropriate data security measures, such as encryption, access control, and data anonymization, to safeguard data privacy and prevent data breaches.

To address these challenges, rating agencies can take the following measures:

Data quality management: Rating agencies should establish strict data quality management processes, including data collection, cleansing, validation, and updates. Additionally, they can establish partnerships with data providers to ensure access to high-quality and reliable data.

Diversification of data sources: Rating agencies can increase the reliability and consistency of data by using multiple data sources. They should also review and validate data sources to ensure their reliability and accuracy.

Timeliness of data management: Rating agencies should establish mechanisms for timely data updates, monitor changes in data sources, and obtain the latest data promptly. They can leverage automated tools and technologies to achieve real-time data monitoring and updates.

Data privacy protection: Rating agencies should establish stringent data privacy policies and measures to ensure data security and privacy. This includes data encryption, access control, data anonymization, and security audits.

In summary, addressing data quality and data privacy challenges is crucial for enhancing the accuracy and reliability of investment ratings. By implementing appropriate measures and leveraging advanced technologies, rating agencies can overcome these challenges and provide more robust and trustworthy rating services.

4.2 Increasing demand for model interpretability and transparency

As machine learning and artificial intelligence applications in investment ratings continue to grow, the demand for model interpretability and transparency has become increasingly important. Traditional rating models are typically based on statistical methods and rules, with a relatively transparent decision-making process that is easy to explain. However, some machine learning models, such as deep learning models, have complex structures and parameters, making their decision-making process less interpretable and understandable. This poses challenges for rating agencies and investors.The following are challenges related to model interpretability and transparency:

Black box models: Some machine learning models,

such as deep neural networks, are often referred to as "black box models" because their decision-making process is not easily explained or understood. This poses difficulties for rating agencies and investors, as they may not be able to understand how the model arrives at rating decisions, making it challenging to verify and scrutinize the model's results.

Model complexity: Certain machine learning models have highly complex structures and parameters, making it difficult to comprehend their internal workings and decision-making processes. This makes it challenging for rating agencies and investors to explain how the models consider various factors and variables and ultimately arrive at rating outcomes[13].

Bias and fairness: Machine learning models can be influenced by data biases and unfairness, leading to biased or unfair rating outcomes. However, due to the complexity of the models, it is challenging to identify the specific sources of bias within the models and how to address these issues.

Regulatory and compliance requirements: In some cases, rating agencies may need to explain the basis for their rating decisions to comply with regulatory and compliance requirements. However, the existence of black box models makes it difficult for rating agencies to meet these regulatory demands.

To address these challenges, rating agencies and researchers can take the following measures:

Adopt interpretable models: Rating agencies can consider using machine learning models with higher interpretability, such as decision trees, logistic regression, and other models with simpler structures and parameters that provide better interpretability and transparency.

Model interpretation methods: Rating agencies can explore and develop model interpretation methods to explain the decision-making process of black box models. This includes techniques such as feature importance analysis, local interpretation methods like LIME and SHAP, which help understand the impact of the model on input data and decision rationale.

Data logging and auditing: Rating agencies can record and audit the decision-making process and input data of the models to provide evidence when model decisions need to be explained or scrutinized. This can include documenting the input data, feature processing procedures, model parameters, and output results.

Transparency reports: Rating agencies can provide transparency reports that detail the principles of the rating models, data sources, feature processing methods, model training process, etc. This increases transparency for rating agencies, making it easier for investors and regulatory bodies to understand and validate the rating outcomes.

Compliance and regulation: Rating agencies should closely follow compliance and regulatory requirements and ensure that the rating process aligns with relevant laws and guidelines.

5. SUMMARY

To address emerging trends and challenges, rating agencies can adopt the following solutions and future directions:

Strengthen sustainability rating capabilities: Rating agencies should enhance their assessment and research of sustainability factors, incorporating environmental, social, and governance considerations into the rating process. They can collaborate with sustainability experts and organizations to develop sustainability rating standards and methodologies.

Utilize big data and artificial intelligence (AI) technologies: Rating agencies can leverage big data and AI technologies to improve rating models and analytical capabilities. Establishing data partnerships to access comprehensive and accurate data and employing machine learning algorithms can enhance rating accuracy and efficiency.

Enhance regulatory and compliance capabilities: Rating agencies need to strengthen their internal compliance systems to ensure adherence to regulatory requirements. Close cooperation with regulatory authorities can help rating agencies stay updated on regulatory changes and take appropriate measures to ensure compliance.

Explore blockchain technology applications: Rating agencies can research and apply blockchain technology to enhance data security, transparency, and trustworthiness. Establishing blockchain-based data platforms can ensure data integrity and immutability, providing publicly verifiable rating results.

Provide personalized rating and customized services: Rating agencies can develop flexible rating models and services to meet the diverse needs of investors. Utilizing technological and data analysis capabilities, they can offer personalized ratings and recommendations, assisting investors in making more informed investment decisions.

Emerging trends and challenges present both opportunities and obstacles in the investment rating field. Rating agencies need to continuously innovate and develop by strengthening sustainability rating capabilities, leveraging new technologies and big data analytics for enhanced rating accuracy, enhancing compliance and risk management, and providing more personalized and customized rating services.

By adapting and addressing emerging trends and challenges, the investment rating field can move towards the following future directions:

Strengthen international cooperation and standardization: Rating agencies can enhance international cooperation with other rating agencies and regulatory bodies to establish standardized rating criteria and methodologies. By establishing platforms for shared data and information, rating agencies can improve rating consistency and comparability, promoting cross-border investments and market development.

Enhance risk assessment and early warning capabilities: Rating agencies can strengthen their risk

assessment and early warning capabilities to promptly identify and evaluate market risks and systemic risks. They can develop more flexible and sensitive risk models, utilizing big data and AI technologies for risk monitoring and prediction, providing timely risk alerts and recommendations to investors.

Foster technological innovation and digital transformation: Rating agencies can actively promote technological innovation and digital transformation, utilizing new technologies and digital tools to improve rating processes and services. For example, they can employ smart contracts and blockchain technology to automate and update rating results, enhancing efficiency and reliability.

Strengthen independence and transparency: Rating agencies need to reinforce their independence and transparency to increase the credibility and public trust in their rating results. They can establish independent rating committees or boards to oversee the fairness and independence of the rating process. Additionally, rating agencies should provide more information about rating methodologies and data sources to enhance transparency and interpretability.

Enhance talent development and expertise: Rating agencies should focus on talent development and expertise, attracting and nurturing professionals with relevant domain knowledge and technical skills. Collaborating with universities and research institutions, they can conduct training and research projects related to ratings, improving the professionalism and technical proficiency of their staff.

In conclusion, the investment rating field faces emerging trends and challenges, but they also bring opportunities and room for development. Rating agencies need to proactively respond to these trends and challenges by strengthening sustainability rating capabilities, leveraging new technologies and big data analytics, enhancing compliance and risk management, and providing personalized and customized rating services. By offering more accurate and reliable ratings and recommendations, rating agencies can facilitate the development of a healthy and sustainable investment market.

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A Review on Compound Word Processing

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Abstract: This paper reviews domestic and international research on the processing of compound words, first reviewing several theoretical models of compound word processing and pointing out the advantages of the two-channel model, then introducing several classical experimental paradigms and summarizing their respective advantages. In addition, this paper reviews the main influencing factors of compound word processing. Finally, this paper summarizes the current situation and problems of compound word processing and points out the future research direction.
Keywords: Compound Word Processing; Decomposition Model; Two-channel Model; Semantic Transparency

1. Introduction

Compound word is a common phenomenon among human beings, and the combination of morphemes is a common paradigm for forming new words in English by utilizing morphological rules. There are two types of morphemes: sticky morphemes and free morphemes. Sticky morphemes need to be combined with other morphemes to form a new word that conforms to the rules of syntax and semantics. Free morphemes, on the other hand, have independent meanings, and can be used alone or combined to form a new word called a compound word. The mental representation and processing mechanism of compound words has been a widely concerned issue in psycholinguistic research. Studying the processing of compound words in different languages can not only provide evidence for cross-linguistic research, but also explore the universality and specificity of lexical processing mechanisms, which is significant especially in second language acquisition and output. Morphemic information is one-language processing, and the frequency, morphology (orthography), and semantic features (e.g., semantic transparency, morpheme meaning, etc.) of morphemes are important influences on the processing of compound words. Among them, whether semantic transparency affects the early processing of compound words is a research question that has been the focus of academic attention. Looking at the results of previous studies, we find that there are three main processing modes for compound words: the first is simple form decomposition processing, and semantic transparency does not affect the early processing of compound words. The second is dual-route processing, i.e., transparent words are processed by decomposition processing, while obscure words are processed by whole word

processing; and the third is decomposition processing, and semantic transparency has a moderating effect on the early processing of compound words. Although the morphological structure of words has been found to be an important factor influencing lexical processing, most of these studies have focused on the processing of first language derivatives and inflected words (Taft & Forster 1975; Schreuder & Bayen 1997; Longtin & Meunier 2005)[37] [31] [19] . Research in the field has also shown a preference for derivatives and inflections (Silva & Clashen 2008; Diependaele et al. 2011)[33] [7] . Since the development of bilinguals' mental vocabulary is mainly influenced by first-language background (Silva & Clahsen 2008) [33] and second-language proficiency (Elston Guttler et al. 2005)[9] , how do Chinese-English bilinguals process English complex words, and what are the similarities and differences in English complex word processing among Chinese-English bilinguals at different levels? Compared to the processing of other complex word classes, less attention has been paid to compound words. However, compound words are the most common method of constructing complex words in the world's languages, and compound words are a common phenomenon in many languages (Dressler 2006)[8] . Compound words consist of two or more units of meaning (morphemes), but the meaning of the whole word of a compound is often not equivalent to a simple superposition or combination of the semantics of its constituent morphemes (e.g., butterfly has no relation to the original meanings of butter and fly), whether compounds have new modes of representation that are independent of their constituent morphemes, whether or in what way they are linked in the mental lexicon, whether their processing mechanisms are the same or different, and whether their processing mechanisms are the same or different. Whether they are processed by the same or different mechanisms are questions that remain to be answered in the field of mental lexicon and lexical processing. As a prolific word formation, compounding and its product, compound words, occupy a relatively important position in the major languages of the world. Therefore, understanding the representation and processing patterns of compound words is of practical significance for vocabulary acquisition, memorization and teaching methods in second languages. In view of the above background, this paper intends to review the overview of the research on compound word processing at home and abroad, sort out the relevant theoretical models established in the existing research, categorize, analyze and evaluate the existing

researches from the perspective of research methodology, and point out the direction and trend of the future researches on the basis of the basic status quo, characteristics and dynamics of the research on compound word processing.

2. A theoretical model for the study of compound word processing

At present, the academic controversy over the processing model of compound words mainly focuses on the "decomposition model" or "non-decomposition model", i.e., whether the processing of compound words is to take the whole word processing as in simple vocabulary or to decompose into the processing of lexemes constituting the compound words, due to the different research objects, research methods and research focuses, researchers have reached different conclusions. Whether the processing of compound words takes the form of whole word processing like simple vocabulary or the processing of morphemes that constitute compound words, there are differences in the conclusions reached by researchers due to the differences in the objects of research, research methods and research centers. Early findings support the "decomposition model" of processing compound words (Taft & Forster 1976; Zwitserlood 1994; Libben 1998)[34] [43] [18] . Researchers have argued that there is a lexical decomposition process in the processing of compound words, and that the morphological structure of compound words affects their processing. However, some researchers hold the opposite view, for example, Butterworth (1983)[5] believes that the "morphological structure" of compound words is merely a combination of semantic and spelling information, and that compound words are still processed as a whole. The "non-decompositional model" has been divided into the "whole word list model" and the "connectivist model", both of which have in common the denial of the influence of morphological structure on the processing of compounds. They share the common ground of denying the influence of morphological structure on compound word processing, but they give different explanations for the role of influencing factors in the processing process (as will be explained in more detail below). In addition to the "decomposition model" and the "non- decomposition model", the "dual-route model", which combines the two, has also been supported by a number of empirical studies (Carammaza et al. al. 1988; Schreuder & Bayen 1995)[6] [30] . The "dual-route model" suggests that there are two channels for processing compound words: whole-word processing and decomposition processing at the same time. The two most influential dual-channel models are the "serial dual-channel model" and the "parallel dual-channel model", which will be further described and compared below.

2.1 Decomposition model

The Decomposition Model considers lexemes as the basic unit of lexical representation and processing, which means that the representation of compound words in the mental lexicon is realized through lexemes. The processing of compound words is realized by processing lexemes on the basis of morphological decomposition, which is an automated process prior to lexical access. For example, when processing the compound word blackboard, only black and board can be extracted in the mental lexicon separately, and then the compound word blackboard can be processed because the word blackboard does not exist in the mental lexicon, only black and board exist. some experimental results also support this processing model. For example, Taft and Forster's (1976) experimental results showed that nonwords that are prefixed word stems (e.g., juvenate) take longer to classify than nonwords that are not stems (e.g., pertoire), suggesting that nonword stems are directly represented in the mental lexicon, and that prefixed words are analyzed for their constituent morphemes before they enter the lexicon[34] . This finding also suggests that compound words are processed through morphological decomposition, which proceeds from left to right, with the first morpheme of a compound word being used as the access code. However, in their further study, Taft's (1994) experiment changed important items from the original experiment and found the presence of whole-word representations, but still argued that decomposition processes precede whole-word extraction[35] . Wu & Zhang (2021) used a masked-initiation experimental paradigm to compare the effects of semantic transparency on compound word processing in native and bilingual Chinese, and the results of the experiments demonstrated that compound word processing uses decomposition[39] . The core of the decomposition model is to emphasize the role of morphological structure in lexical processing, arguing that the decomposed representation and processing model can save the brain's storage space because it is not necessary for learners to build another separate compound word lexicon in their mental lexicon, thus enhancing the organizational efficiency and normativity of the mental lexicon. However, the decomposition model also has problems. While it has the advantage of improving storage efficiency, it sacrifices processing efficiency. If compound words are stored in the mental lexicon in the form of morphemes, learners can only process compound words by extracting morphemes and semantic combinations each time they process them, which inadvertently increases the processing load of learners and may reduce processing efficiency. Therefore, based on this problem, some researchers have proposed Non-decomposition Models.

2.2 Non-decomposition models

Non-decomposition Models can be categorized into Full-listing Model and Connectionist Model. Full-listing Model assumes that the meaning of a compound word cannot be simply reduced to a combination of

lexical meanings, and therefore, like simple words, compound words have independent representations and existence in the brain (Butterworth 1983)[5] . The model assumes that both simple and complex words are explicitly listed in the mental lexicon and can therefore be processed by means of whole-word extraction. Butterworth compared the judgment reaction times of simple and compound words and found no significant differences. And his further study also found that subjects' reaction times to idioms were also faster than random phrases of the same length, suggesting that even idioms are stored independently in the brain. Chen et.al (2021) investigated the processing mechanisms of English bilingual suffix derivatives in Chinese learners of English by using the masked-initiation experimental paradigm of the lexical base-whole- word, and the processing mechanisms of English bilingual suffixes of Chinese learners of English. The processing mechanism of Chinese learners' L2 suffix-derived words is whole-word extraction. Non-decomposition Models denied the role of morphological structure in lexical processing, but since more and more experimental results proved that there is indeed a decomposition process in the processing of compound words, the supporters of Non-decomposition Models have gradually diminished. The role of morphological structure is also rejected by the Connectionist Model, which argues for a decade of cumulative effects of lexical spelling, phonological and semantic information without specialized morphological representations (Plaut & Gonnerman 2000; Seidenberg & Gonnerman 2000)[26] [32] . For example, in lexical priming experiments, priming effects differed across semantically transparent compound words: priming effects were greater in the case of fully semantically transparent and similarly spelled than in the case of low semantic transparency or semantically obscure semantically opaque.

2.3 Dual-route models

In recent years, more and more researches have shown that neither decomposition model nor non-decomposition model can explain the processing of compound words and other complex words well, so some scholars have proposed Dual-route Models (Caramazza et al. 1988; Schreuder & Baayen 1995; Pollatsek,2000)[6] [30] [27] . Dual-route Models suggest that complex words are processed in the mental lexicon in both whole- word and morpheme ways, which corresponds to the existence of two different processing channels: whole-word processing and disjunctive processing. For certain types of complex words (e.g., regular forms of the past tense of verbs), decomposition can be used for storage and processing, while for other words (irregular forms of words), whole-word storage and processing are chosen. The Dual-route Models seem to have stronger explanatory power, but there are again different explanations for how the two channels are chosen,

how they work, the sequence of their effects, and their relationship with the influences on the complex word. different explanations. Currently, there are two influential two- channel models, the Morphological Race Model (or Race Model, or MRM) (Schreuder & Bayen 1995)[30] and the Augmented Addressed Morphology Model (or AAM) (Caramaza et al. 1988)[6] . The MRM posits that the decomposition channel and the whole word channel operate in parallel and compete with each other. When the brain receives an input signal for a complex word, both channels are activated at the same time and compete with each other under influences such as word frequency and semantic transparency, and the brain takes the winning channel. Another two-channel model, AAM, also assumes that the decomposition channel and the whole-word channel coexist. Unlike MRN, while both whole-word and morpheme representations can be extracted, whole-word extraction is the default approach, and the brain automatically adopts morpheme extraction once whole-word extraction is unsuccessful. Although slightly different, both agree that whole-word processing is mostly used for high-frequency or high-familiarity complex words while disambiguation processing is mostly used for low-frequency or low-familiarity complex words. Currently, the dual-channel model is a widely recognized and accepted model of complex word processing, and a large number of empirical studies have provided evidence for dual-channel (Sandra 1990; Bayen et al. 1997; MacGregor & Shtyrov 2013; Yu & Tian 2019)[29] [] . And the research controversy centers around how factors such as word frequency and semantic transparency play a role in the choice of the two channels (Frisson et al. 2008; Libben et al. 2003; Mareli & Luzati 2012).

3. AN EXPERIMENTAL PARADIGM FOR COMPOUND WORD PROCESSING

Currently, the main research method for compound word processing is lexical recognition, of which the more common experimental methods are lexicon decision and priming experiments, followed by eye-tracking experiments. These experimental paradigms are described in detail in this section.

3.1 Lexical judgment experiment

Lexical judgment experiments are the most commonly used research paradigm in compound word processing research. In lexical judgment tasks, the target words are usually true compounds and pseudo-compounds (pseudo-compounds) or compound nonwords [3] . The target words are presented in a certain way and the subject is asked to determine whether they are true or false by some action (e.g., pressing a key, etc.). The computer software records both response time and correctness, which is used as a basis for analyzing the processing mechanism of the subject's compound words. Taft and Forster (1976) are the pioneering study that used lexical judgment experiments to study the representation and processing of English

compound words (see 2.1). And nowadays, the lexical judgment experiment paradigm is still the primary choice of researchers in the study of compound word processing mechanisms.

3.2 Launching an experiment

The initiation experiment is actually a lexical judgment task, except that two stimulus words are presented during the experiment, the former as the initiator and the latter as the target word, and the subjects are only required to make judgments about the target word. The purpose of the initiation experiment is to test whether the initiating word has an initiating effect on the target word, i.e., whether the initiating word helps the subject to make a quicker and more accurate judgment on the target word. In compound word processing research, priming experiments usually take partial repetition priming (partial repetition priming, where the primer is a compound word morpheme and the target word is a compound word, or vice versa) or semantic priming (semantic priming, where the primer and the target word are semantically linked). Compared with the lexical judgment experimental paradigm, the priming experiment introduces the priming word, and the researcher can manipulate the relationship between the priming word and the target word according to his or her own research needs, so as to directly judge the interactions between the lexeme and the composite whole word, and thus the priming experimental paradigm is a more suitable experimental paradigm for the research of compound word processing.

3.3 Eye movement experiment

In recent years, with the wide application of eye-tracking experimental techniques in the fields of psychology and linguistics, they have also been applied in empirical studies of compound word processing. In eye movement studies, various forms of compound words are used as target words, and the parameters measured are first fixation and gaze duration. In such experimental paradigms, eye-trackers usually record and analyze the trajectories of the subject's eye movements. Compared with the previous two experimental paradigms, the advantage of eye movement experiments is that subjects can be observed continuously in a natural reading environment, which not only helps to reveal the experimental process of vocabulary processing, but also makes the experimental data more objective. In the future, eye-tracking experiments are bound to assume an increasingly important role in compound word processing research.

4. INFLUENCES ON THE PROCESSING OF COMPOUND WORDS

A variety of factors influence compound word processing, and three main ones are presented here: semantic transparency, lexical position, and bilingual proficiency.

4.1 Semantic transparency

Semantic transparency refers to the extent to which the whole word meaning of a compound word can be inferred from the semantics of its constituent morphemes (Wang & Peng 1999). If the semantic meaning of a compound word can be easily inferred from the meanings of the morphemes that constitute it, it means that its semantic transparency is high. On the contrary, if there is not much correlation between the morphemes constituting the compound word and the semantics of the compound word, it means that its semantic transparency is low. Words with high semantic transparency are called transparent words, and those with low semantic transparency are called opaque words. Libben et al. classify the semantic transparency of compound words into four categories according to the degree of correlation between the meaning of the morpheme in the compound word and the meaning of the morpheme as an independent root: TT (transparent-transparent); OT (opaque-transparent); TO (transparent-opaque) and OO (opaque-opaque), and this division facilitates the discovery of the effect of semantic transparency of morphemes on the processing of compound words [21] [17] .

Whether semantic transparency is activated in the processing of monolingual compound words is an important research question in compound word processing. Researchers have conducted activation experiments in different languages, but have not been able to form a unified conclusion. Sandra studied the effect of semantic transparency on Dutch compound word processing through semantic activation experiments, and found that only transparent words have semantic activation effect, and the processing of obscure words is not affected, therefore, transparent and obscure words are processed differently: transparent words are processed by decomposition, and obscure words are processed as a whole [28] ; however, Libben et al. found that both transparent words and obscure words have activation effect, and the processing of transparent words is not affected. processing [28] ; however, Libben et al. found that there was an initiation effect for both transparent and obscure words, with no significant effect of semantic transparency [18] . Jarema et al. examined the effect of semantic transparency on the processing of French and Bulgarian compounds and found that an initiation effect was observed for both transparent and obscure words in French, but no initiation effect was observed for obscure words in Bulgarian. effect. In contrast, semantic transparency plays an important role in the processing of juxtaposed compound words in Chinese. However, Smolka and Libben found that semantic transparency of German compound morphemes does not affect compound word processing [30] . In the research on the effect of semantic transparency on bilingual compound words, the main focus has been on examining the processing of English bilingual compound words, however, no uniform conclusions have been drawn either. Chen et al. examined the representation of English bilingual compound words

in the mental lexicon through a lexical naming experiment, and found that semantic transparency had little effect on the storage of compound words for high level subjects. Wang et al. examined the processing mechanism of English compound words in Chinese learners of English by a no-initiation lexical judgment task to examine the processing mechanism of English compound words in Chinese English learners, and no semantic transparency effect was found. Wu & Zhang (2021) explored and contrasted the effects of semantic transparency on the processing of compound words in native and bilingual Chinese speakers, and found that the early processing of compounds was disambiguated in both native and bilingual speakers, but for native Chinese speakers for native Chinese speakers, semantic transparency may affect the processing of compound words; while for bilingual Chinese speakers, semantic transparency has no effect [38] . However, some researchers have come to opposite conclusions. Gan & Zhang examined the representation and access of compound words for Chinese-English bilinguals using a lexical judgment task with a repeated initiation paradigm, and found that English compound words are mixed stores and semantic transparency is an important factor affecting their processing [21] . Zhang et al.'s SOA initiation experiment examined the time course of bilingual compound word processing for Chinese ELLs, and found that compound words are processed in the early stages of decomposition. processing time course, and found that the semantic transparency effect of compound words gradually weakened with the advancement of processing time course.

Overall, the experimental evidence for the effect of semantic transparency on the processing of bilingual compound words is still insufficient, with the following main problems: (1) most experiments examine the processing of English compound words, and future research can provide better experimental evidence for the processing of bilingual compounds by incorporating other bilingual language varieties; (2) the types of compounds tend to be mostly transparent and obscure, and there is a lack of partially transparent words in the research; (3) future research should be directed at designing experimental paradigms for comparing the recognition processes of native speakers and second language speakers to better compare the similarities and differences in their processing.

4.2 Morpheme position

A central topic in experiments to validate the processing patterns of compound words has been the study of lexical morphemes' representational access.

Given that the constituents of compound words are all free morphemes, a number of studies have examined the processing differences between left and right morphemes, with mixed findings. Some studies have found higher activation of left morphemes, suggesting that left morphemes are prioritized by left-to-right

recognition habits (Kuperman et al 2009)[15] . Lexeme position also showed different time course effects. Yu (2017) found that the priming effect of left morphemes was stronger when the SOA was 66 ms, whereas the priming effect of right morphemes was only found for familiar compound words. When the SOA was 300 ms, the priming effect of left morphemes was still significant, whereas the priming effect of right morphemes was only found in semantically transparent and more familiar compound words[39] . In contrast, other studies have found that right morphemes are activated to a greater extent because they are usually in the central semantic position of the compound word (Marelli & Luzzatti 2012) [21] . Other studies have not found a positional effect of morphemes, i.e., both activate the whole word equally or the positional effect of morphemes varies with the degree of semantic transparency: left-placed morphemes are more likely to activate semantically obscure compounds, whereas right-placed morphemes are more likely to activate semantically transparent compounds. Zhang et al. (2021) examined lexeme position and semantic transparency in the processing time course of compound words by Chinese ELLs using a series of three initiation experiments with 200 ms, 400 ms, and 600 ms SOAs. The results revealed that there was a stable lexical activation access phenomenon in the processing of compound words by English learners[40] . This lexical information access is significantly correlated with lexical position, and shows the positional effect of "left position is strong and right position is weak". The authors believe that the reason for this result is that learners rely too much on the left lexical information and ignore the right lexical information in the acquisition of bilingual compound words. However, the reasons for the different positional effects need to be verified by more research and deeper explanation.

4.3 Second language proficiency

There are fewer studies on the mechanisms of compound word processing and the role of second language level has not been considered. Since the development of bilinguals' mental vocabulary is mainly influenced by their monolingual background (Silva & Clahsen, 2008) and bilingualism (Elston-Guttler et al., 2005), how do Chinese-English bilinguals process compound words in English, and what are the similarities and differences in the processing of compound words by Chinese-English bilinguals at different levels of proficiency[32] [9] ? What are the differences and similarities in English compound words processing among Chinese- English bilinguals with different levels of proficiency? There are limited studies on how bilingual proficiency affects the processing of compound words, Zhao (2014) inferred that high and low level learners have the same processing process based on the same speed of judging the whole word. However, the conclusion of this study is debatable because the consistent speed

of whole- word judgments does not indicate that the processing of the first and last morphemes and their interaction with the whole word are the same. Yu & Tian (2019) examined the similarities and differences in English compound word processing between high- and low-level learners in China using a repeat-start online vocabulary judgment task. The results found that: both groups of learners used a multi-channel model; the difference was that the low-level group's whole-word semantic activation was late, occurring after the activation of the first lexeme and before the activation of the last lexeme, and the processing of the last lexeme was incomplete, with the first lexeme producing a familiarity effect and the last lexeme producing a transparency effect; the high-level group's processing of the whole-word semantic cues began at the early stage of compound-word processing, and was enhanced after the activation of the whole-word form, and the processing of the last lexeme was more thorough, with the first and last lexeme both The first and last morphemes both produce transparency effect and familiarity effect, but the transparency effect is weaker than the familiarity effect. The results show that the processing of compound words is different from that of complex words, and that the second language level does not affect the processing pattern, but does affect the activation time and processing intensity of compound words and their morphemes. However, the study examined second language learners and did not compare the similarities and differences in the processing of complex words between native speakers and second language learners, especially the similarities and differences in the processing between high level second language learners and native speakers. This shows that there are still some areas of bilingual compound word processing that have not been touched, and many questions remain to be answered. Researchers need to adopt more scientific methods and conduct more detailed investigation and research on bilinguals of various identities and language levels.

5. CONCLUSION

In summary, although the research on compound word processing has made initial progress, there are still different aspects of controversy. First, the two-channel model has more explanatory power for compound word processing, but the "parallel two-channel" and "serial two-channel" may coexist, and different research materials and research objects support different theories. Future research should focus on how the parameters that select a particular channel act on the processing. Second, more research should be conducted on the factors affecting compound word processing, especially on the comparison of subjects from different linguistic and cultural backgrounds. In addition, in terms of research methodology, although the experimental paradigm of lexical judgment and the initiation paradigm are already mature and the application of eye movement

experiments is becoming more and more widespread, more experimental paradigms, such as ERP and fMRI, should be explored in the future. Finally, in terms of subject selection for bilingual compound word processing, foreign researchers usually choose balanced bilinguals, i.e., acquiring both one and two languages at the same time, and the linguistic distance between one and two languages is relatively close (e.g., belonging to the same Indo-European family). But there is still a lack of empirical evidence on whether these results can be applied to unbalanced bilinguals in China. Therefore, future research could focus more on the processing or acquisition of compound words by Chinese EFLs, while comparing existing studies to better identify differences and fill gaps in the field.

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Research on Risk Management and Control in Collaborative R&D of Airborne System

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Abstract: With the rapid development of aviation technology, the on-board system of modern aircraft has become more and more complex. It includes navigation, communication, monitoring, control and other diverse subsystems, highly integrated hardware and software not only provides the basic functions required by the aircraft, but also improves flight safety, comfort and efficiency. However, with the increasing complexity of airborne systems, the requirements for safety and reliability of airborne systems in civil aviation are constantly increasing, which not only brings new challenges to the design, manufacture and verification of airborne systems, but also puts forward new requirements for the capability of R&D and management of airborne systems in civil aircraft.

Keywords: Airborne System; Risk Analysis; Risk Control

1. BACKGROUND

Under the new challenges of R&D management, the project focusing only on the T-Q-C triangle can no longer meet the current management requirements, and it is necessary to achieve comprehensive control of project risks in the process of project implementation.Airborne system research and development project is complex and high-risk, in the airborne system research and development project, in addition to the traditional management risks, such as schedule, cost and resource risks, but also need to consider the maturity, quality, process and other aspects of technical risks.This paper will discuss the management risks and technical risks in airborne systems development projects, and how to effectively manage these risks.

2. RISK IDENTIFICATION AND DEFINITION

In airborne system research and development projects, according to different risk sources, risk categories can be divided into management risk and technical risk. Management risk mainly includes schedule risk, resource risk, cost risk, communication risk, etc., which affect the success of the project during project implementation.Technical risks mainly include quality risks, process risks and technology maturity risks that affect product delivery in the process of R&D.These risk categories are described in detail in this section.

2.1 Managing Risks

Management risk refers to the risk caused by improper decisions and behaviors of managers in enterprises or organizations, as well as internal operation and process errors, which mainly includes schedule risk, resource risk, cost risk and communication risk.

2.1.1 Schedule risk

Schedule risk refers to the uncertainties or potential problems that cause the schedule to be delayed or cannot be completed on time during the implementation of the project, and these risks may have a negative impact on the schedule and delivery time of the project [2].

The factors leading to project schedule risk mainly include unclear project scope, demand change, human resource problems, supply chain interruption, internal and external force majeure, etc.

2.1.2 Resource risks

Resource risk refers to the potential problems or uncertainties related to resources during the project and execution process, which may negatively affect the availability, efficiency and quality of project resources (such as manpower, materials, equipment, etc.).

The factors that lead to the risk of project resources mainly include insufficient project human resources, substandard technical ability of personnel, improper structure of project resources, insufficient equipment and tools, and insufficient material resources.

2.1.3 Cost risk

Cost risk refers to the uncertainties or potential problems associated with cost during the execution of a project, which may cause the cost of the project to exceed the budget or be unstable, and cost risk can negatively affect the financial health and sustainability of the project.

The factors leading to project cost risk mainly include inaccurate cost estimation, demand change, price rise, supply chain problems, technological innovation cost, insufficient change control, etc.

2.1.4 Communication risk

Communication risk refers to the potential problems or uncertainties related to the transmission, communication and exchange of information during the implementation of the project.These issues can cause information to be lost, misunderstood, unclear, or untimely, which can negatively impact project goals, schedules, and relationships.

Factors leading to project communication risks mainly include unclear communication plans, cultural differences, professional differences, unsuitable communication tools, information overload, inaccurate or incomplete information, etc.

2.2 Technical Risks

Technical risks refer to technical problems, defects,

and errors that cause the product to fail to achieve the required functions, security, and reliability. As a result, the performance, security, reliability, stability, and ease-of-use of the system or device are adversely affected.Technical risk mainly includes quality risk, process risk and technology maturity risk.

2.2.1 Quality risk

Quality risk refers to potential problems or uncertainties related to product quality during the development of airborne systems that could cause the system or equipment to fail to meet specified quality standards or customer expectations, which could negatively affect the success of the project.

Factors leading to quality risk mainly include design defects, manufacturing problems, process instability, lack of personnel skills, material quality problems, demand changes, etc.

2.2.2 Process risk

Process risk refers to the potential problems or uncertainties related to the R&D process system during the development of the airborne system. This risk may lead to quality problems of the system or equipment, resulting in lower confidence of the host and the bureau on the product.

The main factors leading to process risk include lack of development system or system substandard, development system is not implemented in the development process, development plan and system mismatch, lack of process assurance monitoring and so on.

2.2.3 Technology maturity risk

According to the requirements of airborne system development, only equipment with technical maturity of TRL6 or above can be used as installed products. Technology maturity risk means that the airborne system or equipment fails to meet the technical maturity standard during the development process and cannot pass the relevant verification test of TRL6 or above. This risk will lead to the delay of the development progress of the entire airborne system.

The main factors that lead to the risk of technology maturity include the unverified new technology, the compatibility problem between different technology components, and the complex debugging and testing required for technology integration.

3. RISK ASSESSMENT AND IMPACT ANALYSIS

After the risks are identified, all project stakeholders need to conduct qualitative and quantitative analysis of the identified risks, analyze and evaluate the possibility of risk occurrence and its corresponding consequences, determine the degree of risk harm and the priority of treatment [3].

3.1 Qualitative analysis of risk

Qualitative risk analysis is the assessment and understanding of the nature, characteristics and relative importance of potential risks.The project stakeholders need to comprehensively analyze the source and nature of the risks according to the nature, characteristics and causes of the identified risks, and conduct a preliminary analysis of their occurrence probability and impact.All stakeholders of the project can conduct qualitative analysis through the risk analysis matrix, and the indicators of qualitative analysis mainly include risk occurrence probability, risk impact degree, risk priority, risk occurrence period and other factors [4].

Qualitative risk analysis is the starting point for risk management and helps to determine which risks require more detailed quantitative analysis and which risks require control measures.It provides a basic risk profile that helps the project management team prioritize the most serious risks.

3.2 Quantitative risk analysis

After the qualitative analysis of identified risks is completed, further quantitative analysis of risks can be carried out based on the results of the qualitative analysis of risks, which aims to provide specific numerical estimates of risks to more accurately assess the impact of risks on the project.By collecting project experience, historical data, experimental results and industry standards, the stakeholders of the project estimate the possibility of risk occurrence by means of probability distribution and historical data analysis.The quantitative impact of risk on project cost, schedule, quality and resources is calculated through risk assumption, so as to further analyze the impact degree of risk.

Quantitative risk analysis provides a more accurate risk estimate, enabling project stakeholders to better understand the nature and extent of risk, and thus to plan and execute risk responses more effectively.

4. RISK RESPONSE AND CONTROL

According to the qualitative and quantitative analysis results of risks, all stakeholders of the project should formulate risk response measures for risks that have exceeded the acceptable range, including risk avoidance measures, risk mitigation measures and risk transfer measures [5].

4.1Risk avoidance measures

Risk avoidance measures are one of the most direct risk coping strategies. The core idea is to avoid high-risk activities, decisions or resource allocation as much as possible, so as to reduce the probability or impact of risk events.Common practices include deciding whether to proceed with the project through indicators such as risk thresholds and profit potential, continuous monitoring and regular assessment of potential risks, and searching for alternative solutions or methods.

Risk avoidance is an effective strategy to reduce potential risks, but it may also bring opportunity costs, and sometimes risk avoidance may lead to missing potential benefits. Therefore, the balance between risk avoidance and the pursuit of opportunities needs to be carefully balanced [6].

4.2 Risk mitigation measures

Risk mitigation measures aim to reduce the impact or

consequences of a potentially risky event, even if they do not eliminate the risk entirely.Risk mitigation focuses on taking measures to reduce the severity, probability, or extent of damage of a risk event to ensure a better response to the risk when it occurs.Common practices include measures to reduce the probability of risk occurrence, contingency plans to reduce the severity of risk events, and so on.

4.3 risk transfer measures

Risk transfer is designed to transfer the responsibility and burden of potential risks to other interested parties.This means that if a risk event occurs, the liability and economic loss will be borne by other parties, not by themselves.Common practices include the use of subcontracting to assign specific tasks or responsibilities to subcontractors, and the transfer of responsibilities to the other party to the contract through the terms of the contract.

5. RISK STATUS MONITORING

After the risk response plan is formulated and implemented, all stakeholders of the project shall continue to track, evaluate and monitor the risk status and treatment, update the completion and description of the risk response measures in a timely manner, and hold regular risk review meetings to discuss the risk status and treatment.At the same time, all stakeholders of the project need to regularly re-evaluate risks (including occurrence probability and impact degree), timely update the latest status of risks, ensure the effectiveness of risk response measures, and make timely responses to possible secondary risks.

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Career Adaptability and Work Adaptation: The Mediating Role of Personal Initiative

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Abstract: This study explores the relationship between career adaptability and work adaptation, and how it is influenced by personal initiative and leader-member exchange (LMX). Data was collected from 63 teams, comprising 63 supervisors and 272 employees, using a paired questionnaire survey. The findings, analyzed using a multi-level linear model, revealed that career adaptability positively correlates with work adaptation. Furthermore, personal initiative was found to mediate this relationship. The study also discovered that LMX can moderate the relationship between personal initiative and work adaptation; a stronger LMX results in a stronger relationship between personal initiative and work adaptation. These findings contribute to our understanding of career adaptation and development.
Keywords: career adaptability; work adaptation; personal initiative; leader-member exchange

1. INTRODUCTION

With the advent of digital transformation, enterprises in China reshaped themselves in organizational structure, operations, and business model, which is a career shock to employees, necessitating adaptation to their evolving roles. According to career construct theory, career adaptability is instrumental in facilitating a smooth transition during such changes [1]. It not only aids individuals in adjusting to new career roles but also empowers them to bring about changes in themselves and their circumstances for achieving career satisfaction and success [2], which ultimately results in employees' work adaptation. However, it's important to note that this process of adaptation is complex and dynamic, involving multiple organizational and individual factors.

Personal initiative could potentially elucidate the individual-level mechanism of which career adaptability prompts employees to take proactive steps towards workplace adaptation. In the context of global economic integration and rapid technological advancement, personal initiative is increasingly becoming a significant factor in performance and change [3]. For example, Individuals possessing a high level of personal initiative often demonstrate greater independence in their knowledge-seeking endeavors. This ongoing acquisition of new knowledge equips employees with the necessary tools to navigate workplace changes more effectively [4]. Work adaptation is defined as the ability of employees to

continually adjust to job demands within a dynamic environment [5]. Therefore, it's plausible that personal initiative may have a correlation with career adaptation. This mechanism also might be influenced by leadership-related factor, such as leader-member exchange (LMX). LMX theory elucidates the two-way relationship between leaders and their subordinates, and predicts the work outcomes of LMX (e.g., [6]). In the context of digital transformation, the changes in task and workplace would pose challenge to all employees. However, LMX can potentially enable supervisors to assist employees in addressing these challenges during the transition, ultimately leading to successful work adaptation.

The current research endeavors to link career adaptability and work adaption, and to reveal its underlying mechanism. This research could potentially make the following contributions: Firstly, by introducing personal initiative and leader-member exchange as potential mediators and moderators, this research could reveal the mechanism at both the individual and organizational levels; Secondly, this research could enhance the career construction theory by examining employees in firms undergoing digital transformation, thereby extending the application of this theory; Lastly, this research could provide valuable insights for career consulting and managerial consulting for firms undergoing changes.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. THE ROLE OF CAREER ADAPTABILITY IN WORK ADAPTATION

Career adaptability, a concept derived from the theory of career maturity, plays a pivotal role in work adaptation. This concept was initially introduced by Super and Knasel (1981) [7]. They posited that career adaptability emphasizes the interactions between the individual and the environment, representing an individual's ability to manage stress and acclimate to environmental changes in the professional sphere. They stressed the importance of individuals being proactive in adapting to environmental changes. Career adaptability is also viewed as an adaptive resource. It is essential for individuals to possess this ability and resources to respond positively to a changing environment and navigate career uncertainties, thereby achieving potential outcomes. Research has been conducted on the performance

associated with work adaptation, leading to the concept of Adaptive Performance (AP), which pertains to adaptive behavior in the work environment [8]. AP serves as a measure of adaptation outcomes. According to career construction theory, individuals possess career adaptability to manage changing environments and achieve adaptive outcomes [9]. To put it another way, career adaptability can forecast adaptive performance. Furthermore, career adaptability is instrumental in explaining an employee's adaptation to a new job. It has been demonstrated that career adaptability significantly correlates with numerous job outcomes such as job satisfaction and job performance [10, 11]. We posit that career adaptability predicts an individual's adaptation to changes in the work environment. On one hand, resilient individuals possess greater psychological preparedness and adaptive resources to manage the changing work environment. On the other hand, career adaptability can positively forecast career success and aid individuals in better managing their career development and enhancing their performance [12]. Thus, we predict:

Hypothesis 1: Career adaptability is significantly positively related to work adaptation.

2.2. THE MEDIATING ROLE OF PERSONAL INITIATIVE

The theory of personal initiative stems from the notion that an individual's performance can profoundly influence organizational effectiveness. Frese et al. (1996) [13] initially defined personal initiative as a set of behaviors characterized by an individual's proactive attitude at work, which encompasses long-term focus, goal-directed actions, persistence, and self-initiated behaviors.

By examining the four dimensions of career adaptability, namely concern, control, curiosity, and confidence, it can be inferred that personal initiative may have a close relationship with career adaptability. Specifically: (1) Individuals with high concern are alert to future changes and exhibit a sense of planning; (2) Those with high control tend to autonomously manage their career behavior and exhibit self-discipline; (3) Individuals with high curiosity excel at identifying job opportunities and possess a sense of exploration; (4) Those with high confidence can make career decisions autonomously and possess a strong sense of belief [14]. According to the career construction theory, an adaptive response is characterized by the proactive behaviors that individuals exhibit in response to change [1]. Conversely, personal initiative is characterized as a positive and autonomous work behavior where an individual perseveres and responds to challenges encountered while pursuing a goal in a work scenario [3]. Therefore, one could deduce that each of the four dimensions of career adaptability can positively contribute to personal initiative.

Previous research has testified the impact of personal initiative on work outcomes such as performance, innovative behavior (e.g., [15]). Building on this logic, this study examines the influence of personal initiative on work adaptation. Firstly, individuals with a substantial level of l of personal initiative can be more proactive in seizing opportunities and fostering favorable work environments for enhanced performance. Secondly, personal initiative encourages individuals to anticipate potential future changes in their jobs, enabling them to thoughtfully navigate difficulties and achieve their goals. Furthermore, according to the self-determination theory [16], personal initiative, as an autonomous work behavior, fulfills employees' need for autonomy. As a result, individual employees possess greater internal motivation to overcome challenges, adapt to the environment, and ultimately achieve superior work results. In summary, this paper proposes that personal initiative may act as a mediator between career adaptability and work adaptation. Thus, we predict:

Hypothesis 2: Personal initiative mediates the positive relationship between career adaptability and work adaptation.

2.3. THE MODERATING ROLE OF LEADER-MEMBER EXCHANGE

Previous research has demonstrated that leadership significantly influences employee behavior and performance [17], and it is vital for employees to attain career success. Leader-Member Exchange (LMX) is a significant leadership-related factor that describes the reciprocal relationship between a leader and their subordinates. According to the LMX theory, the dependency relationship between leaders and various subordinates differs, leading leaders to employ diverse management strategies when interacting with different subordinates [18].

Previous research revealed that LMX bears a significant correlation with a diverse array of work outcomes including work adaptation (e.g., [19]). LMX also interacts with organizational behavioral variables such as organizational support to influence work adaptation [6]. This interaction effect arises from the social exchange that occurs between leaders and team members during the LMX process [20]. When the level of LMX is high, leaders can foster team member development by providing more support and resources, enabling team members to achieve superior performance. Personal initiative reflects a proactive mindset that enables individual team members to manage environmental changes and overcome challenges [13]. Individuals lacking personal initiative are often deficient in creativity [21] and tend to be passive in changing circumstances, leading to subpar performance and significant psychological stress. Conversely, individuals with high personal initiative maintain a positive attitude, are inclined to plan for the future, and persevere through self-motivation to meet challenges. This allows individuals to better adapt to their environment and realize their potential. The

LMX process, wherein the leader provides more support to subordinates and subordinates reciprocate with better performance, forms a positive feedback loop that deepens the relationship between leaders and employees and strengthens the link between personal initiative and work adaptation. Thus, we predict:

Hypothesis 3: Leader-member exchange (LMX) moderates the relationship between personal initiative and work adaptation. The higher the level of LMX, the stronger positive relationship between personal initiative and work adaptation.

The above hypotheses constitute a moderated mediation model which is shown in Figure 1.
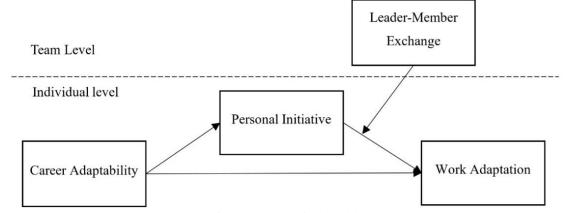

Figure 1. Theoretical model

3. RESEARCH METHOD

3.1. SAMPLE

We employed a snowball sampling technique to collect data from 30 companies in Zhejiang and Shanghai, China, all of which were undergoing digital transformation. A paired questionnaire was designed for the participants, allowing team leaders and subordinates within the same team to evaluate each other on same items. We received responses from 64 teams, but one team with fewer than three members was excluded.

There were 63 valid responses from team leaders, of which the age ranged from 23 to 54 years, with an average age of 34.9; 36.5% were female; The tenure ranged from 2 to 36 years, with an average of 12.3; 60.3% held a bachelor's degree, and 22.2% had a master's degree.

We also gathered 272 valid responses from employees. The age ranged from 18 to 56 years old, with an average age of 29.7; females accounted for 47.3%; tenure ranged from 0 to 35 years, with an average of 7.2; 49.5% had a bachelor's degree and 16.6% had a master's degree.

3.2. MEASURES

All scales used in this study were sourced from top journals and demonstrated good reliability and validity. The original English scales were translated into Chinese using the back-translation procedure. The work adaptation measure used a 7-point Likert scale, while the remaining measures used 5-point Likert scales.

Career adaptability. We employed Savickas & Porfeli's (2012) [1] 24-item scale (*Cronbach's α =* 0.914), which comprises four sub-dimensions. Employees self-evaluated using this scale.

Personal initiative. A seven-item scale developed by Frese et al. (1997) [22] was used to measure personal initiative (*Cronbach's α* = 0.813), which is also self-evaluated by employees.

Leader-member exchange. The LMX Scale developed by Liden and Maslyn (1998) [23] was used in this study, which consists of four dimensions with a total of 11 items (*Cronbach's α* = 0.843 at the individual level). Team-level LMX was computed by aggregating individual responses within the same team.

Work Adaptation. Work adaptation was assessed using a measure adapted from the individual task adaptability dimension of the "Job Performance scale" developed by Griffin et al. (2007) [24]. This measure consists of three items *(Cronbach's α* = 0.916) and was evaluated by team leaders.

Control variables. In this study, gender, age, education level, and tenure of employees were controlled. As education level is a multilevel variable, we created two dummy variables for it: undergraduate and postgraduate.

4. RESULTS

The results of means, standard deviations, and correlations of all variables are shown in Table 1.

A confirmatory factor analysis (CFA) was first used to examine the measurement structure of this study. As there were too many items, this study parceled items of the original construct. Specifically, we used an internal consistency approach to aggregate items from the same sub-dimension of career adaptability and leader-member exchange into item parcels. As depicted in Table 2, the current measurement structure of the four factors exhibited a good fit (X^2 = 318.2; *df* = 113; X^2/df = 2.8; *RMSEA* = 0.082; *CFI* = 0.912; *TLI* = 0.881). This model was better than four alternative measurement models: (1) Merging career adaptability and personal initiative together; (2) Merging personal initiative and leader-member exchange together; (3) Merging personal initiative and work adaptation

together; (4) Merging all variables together.

Table 1. Means, Standard Deviations, and Correlations of All Variables

	M	SD	1	2	3	4	5	6	7	8
1 Female	0.53	0.50								
2 Age	29.67	6.46	-0.06							
3 Tenure	7.24	6.97	-0.098	0.944**						
4 Undergraduate	0.50	0.50	-0.045	0.063	-0.003					
5 Postgraduate	0.17	0.38	0.154*	-0.036	-0.183**	-0.454**				
6 CA	3.80	0.45	0.135*	-0.054	-0.102	0.176**	0.037			
7 PI	3.94	0.52	0.164**	-0.021	-0.044	0.138*	-0.014	0.692**		
8 LMX	4.21	0.45	0.033	-0.062	-0.115	0.144*	-0.019	0.419**	0.433**	
9 WA	4.71	1.02	0.027	0.057	0.048	0.075	-0.043	0.183**	0.220**	0.294**

Note: N=272; CA=career adaptability; PI=personal initiative; LMX=leader-member exchange; WA=work adaption; all correlation coefficients calculated at the individual level; female, undergraduate, and postgraduate are dichotomous variables encoded with 0 and 1; *$p<.05$; **$p<.01$

Table 2. Comparison of Structural Equation Models

Model	X^2	df	X^2/df	RMSEA	CFI	TLI	Inter-model $\triangle X^2$
Model 0	318.2	113	2.8	0.082	0.912	0.881	
Model 1	364.1	116	3.1	0.089	0.894	0.860	M1-M0: 45.9
Model 2	592.8	116	5.1	0.123	0.796	0.731	M2-M0: 174.6
Model 3	866.9	116	7.5	0.155	0.679	0.577	M3-M0: 548.7
Model 4	1198.3	119	10.1	0.183	0.539	0.407	M4-M0: 880.1

The median value of r_{wg} was 0. 92, indicating a high within-team agreement of LMX. The interclass correlation indices ICC(1) and ICC(2) estimates were 0.15 and 0.48, respectively. These indices collectively indicated the appropriateness of aggregating individual data to the team level A null model test for work adaptation revealed significant between-team variance (τ_{00} = 0.166, X^2 = 112.7, $p< 0.001$), accounting for 15.4% of the total variance. This suggests that multi-level analyses are suitable for this study.

Multi-level regression analysis was conducted by SPSS25 and HLM6.08 software. The results are shown in Table 3.

Table 3. Results of Multi-Level Regression Analysis

	Model 1: WA		Model 2: PI		Model 3: WA		Model 4: WA	
	B	SE	B	SE	B	SE	B	SE
Individual level Intercept	2.76**	0.94	0.82*	0.35	2.48**	0.94	4.68**	0.07
Female	0.01	0.04	-0.01	0.01	0.01	0.04	0.00	0.04
Age	0.03	0.13	0.09	0.05	0.00	0.13	0.06	0.13
Tenure	0.00	0.03	0.01	0.01	0.00	0.03	0.01	0.04
Undergraduate	0.04	0.16	0.01	0.06	0.04	0.16	0.06	0.16
Postgraduate	-0.11	0.23	-0.05	0.09	-0.09	0.23	-0.02	0.27
CA	0.41**	0.14	0.80**	0.05	0.14	0.19		
PI					0.34*	0.16	0.38**	0.12
Team Level LMX							0.35*	0.16
Interaction PI×LMX							0.55*	0.27

Note: N=272 at individual level; N=63 at team level; CA=career adaptability; PI=personal initiative; LMX=leader-member exchange; WA=work adaption; female, undergraduate, and postgraduate are dichotomous variables encoded with 0 and 1; *$p<.05$; **$p<.01$

Hypothesis 1 predicted a positive correlation between career adaptability and work adaptation. The results from Model 1 confirmed this, showing a significant positive effect ($t=2.93$, $p<0.01$). Thus, Hypothesis 1 was validated.

Hypothesis 2 proposed that personal initiative mediates the positive relationship between career adaptability and work adaptation. We tested the relationship between career adaptability and personal initiative in Model 2, which was statistically significant ($t=15.04$, $p<0.001$). In Model 3, both career adaptability and personal initiative were included in the regression model. The coefficient of personal initiative was significant ($t=2.09$, $p<0.05$), while the

coefficient of career adaptability was not (t=0.74, *ns*). The Sobel test yielded a significant result (z=2.07, p<0.05), and the effect of the mediator was tested using the Bootstrap method with a 95% confidence interval of [0.012, 0.600]. This suggests that personal initiative fully mediates the relationship between career adaptability and work adaptation, thereby confirming Hypothesis 2.

Hypothesis 3 predicted that LMX could moderate the relationship between personal initiative and work adaptation. In Model 4, the interaction between personal initiative and LMX proved to be significant (t=2.07, p<0.05). To further investigate this, a simple slope test was conducted. As shown in Figure 2, at low levels of LMX, the influence of personal initiative on work adaptation was not significant (z=0.70, *ns*). However, at high levels of LMX, the positive impact of personal initiative on work adaptation was significant (z=3.71, p<0.001).
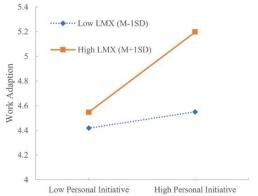

Figure 2. The Interaction Plot

5. DISCUSSION

This study delved into the mechanisms through which an individual's career adaptability influences their work adaptation, using a multi-level model. It further scrutinized the influence of personal initiative and leader-member exchange on this relationship. Empirical analysis revealed that career adaptability was positively related to work adaptation. Personal initiative acted as a mediator between career adaptability and work adaptation, while LMX moderated the relationship between personal initiative and work adaptation. Notably, the relationship between personal initiative and work adaptation strengthens with higher levels of LMX

The findings suggest that individuals with a substantial level of career adaptability would be easier to adapt to a changing work environment, particularly in the context of digital transformation. The four dimensions of career adaptability embody proactive behaviors. These behaviors not only address the current work environment but also anticipate potential future changes in the workplace. These proactive behaviors significantly enhance employees' personal initiative, thereby promoting work adaptation. Personal initiative, considered a personal trait, strengthens an individual's

capacity to adapt. Its interaction with LMX leads to adaptive outcomes for employees. This underscores the importance of both an individual's proactive behaviors and their relationship with their leader in achieving successful work adaptation.

5.1 THEORETICAL CONTRIBUTIONS AND PRACTICAL IMPLICATIONS

This study offers two potential theoretical contributions. Firstly, it investigates the mechanism of an individual's career adaptability on work adaptation, focusing on the mediating role of personal initiative and the moderating role of Leader-Member Exchange (LMX). Personal initiative and LMX represent two distinct sources of motivational factors at both the individual and team levels. This study validates their synergistic effects on employee work adaptation, thereby unveiling the complex mechanism underlying this process.

Secondly, this study augments career development theories, particularly the career construction theory. It does so by validating the role of career adaptability and personal initiative in employees' work adaptation. Given that the samples were drawn from companies undergoing digital transformation, this study adds to the body of literature on career adaptation during organizational change.

This research also holds practical implications for both employees and organizations. For employees, enhancing their initiative and adopting a positive mindset towards unknown challenges are crucial for coping with the evolving organizational environment. In today's era, where information technology is mainstream and the flow of information and knowledge drives organizational development, employees need to be self-motivated. They should strive to improve their initiative, resilience, and ability to persistently tackle difficulties. Preparing for potential future work scenarios, managing their careers independently, and actively seeking resources are also essential for adapting to digital transformation.

For organizations, identifying the career adaptability of individual employees can aid in effective talent allocation. Individuals with high career adaptability can independently make career decisions and manage their roles. They exhibit self-discipline, curiosity, and self-confidence, enabling them to handle various work tasks and role changes effectively. Thus, organizations can assign innovative and challenging tasks to individuals with a substantial level of career adaptability and routine tasks to those with lower adaptability. Moreover, organizations ought to give due consideration to leadership factors. The synergy between personal motivation factors and leadership motivation factors can enhance employees' work adaptation and performance, ultimately boosting organizational performance.

5.2 LIMITATION AND FUTURE RESEARCH

While this study has made significant findings and contributions both theoretically and practically, it does

have certain limitations. Firstly, the study collected data only in one time-point. Given that organizational environments are in a state of constant flux, this design may not adequately capture the dynamic effects of employees' adaptation to the work environment. The reciprocal influence between the organization and individual employees also necessitates a longitudinal study for a more comprehensive analysis of career adaptability's impact on employees' work adaptation. Secondly, the study primarily focused on team-level influences, with less emphasis on organizational-level factors. This approach may not provide a holistic view of organizational influences on employee work adaptation. Future studies could benefit from incorporating more organizational-level factors to enhance the comprehensiveness of the analysis.

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A Survey Research on Digital Collaboration and Entrepreneurship of College Students in the Digital Age

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Abstracts: Digital collaboration plays a crucial role in today's society and workplace, which significantly impacts the efficiency improvement of organizations and teams and plays a vital role in the competitiveness of individuals and their adaptation to the modern work environment. This study aims to deeply explore the impact of digital collaboration on college students' entrepreneurial ability, using a questionnaire survey to collect 426 valid questionnaires from seven undergraduate colleges and universities in Jiangxi Province and descriptive statistics on the results of the questionnaires. The results of the study show that digital collaboration has a significant impact on the enhancement of the entrepreneurial ability of college students. First, digital collaboration tools can significantly enhance students' social activities and communication and coordination skills. Digital collaboration tools emphasize clear and efficient communication, and students need to learn written and verbal communication skills crucial in interacting with colleagues, clients, and superiors. By collaborating and sharing online, students can gain more teamwork experience and learn to work effectively with others, which is crucial for team projects in their future careers. Secondly, digital collaboration helps to improve students' strategic decision-making and organizational and command skills. In addition, digital collaboration contributes to students' pioneering and innovative creative skills. Students need an efficient means of processing and sharing information; digital collaboration tools offer powerful organizational and search functions that enable more effective information management. Therefore, this study concludes that university education utilizing digital collaboration effectively aids its students' adaptation to workplace demands while aiding personal and entrepreneurial success. Educational institutions and educators must focus on training their pupils for digital collaboration to meet marketplace requirements more adequately.

Keywords: Digital Collaboration, Entrepreneurial Competencies, College Students, Enhancement

1. INTRODUCTION

Today's digital era is marked by rapid technological development and information availability that alter how we work and learn. Education has seen digital collaboration emerge as one of the main trends, which transforms teaching and learning methods while creating new learning and development opportunities for students - this change is particularly notable among university students who must adjust quickly to changing workplace demands; hence, it is vitally important that researchers explore its effect on entrepreneurial capabilities of university students.

Entrepreneurial abilities refer to an individual's capacity for recognizing, assessing, and capitalizing upon business opportunities - including social activities such as communication and coordination skills, strategic decision-making capabilities, organizational command skills, and pioneering and innovation skills - necessary for business venture success in today's digitalized economy. Entrepreneurship among university students today increasingly relies on these essential qualities for its success. Digital collaboration, as a new way of working that combines technology and teamwork, offers new ways to enhance these entrepreneurial skills.

In recent years, many studies have begun to focus on using digital collaboration in education and its impact on the development of student competencies. For example, Pano and Gjika explored how digital platforms promote entrepreneurship among Albanian university students, showing that digital collaboration tools provide knowledge and skills learning and stimulate entrepreneurial thinking and practice[1]. On the other hand, Marzo-Navarro and Berné Manero's study focuses on learning cross-disciplinary skills in an online entrepreneurial environment. This study highlights the potential of digital collaboration in improving students' practical and vocational skills [2]. The research of Whewell et al. investigated how digital collaboration could assist university students with change-making and digital fabrication competencies from an international perspective, showing it could serve as an effective means of helping develop entrepreneurial and change-making competencies as part of globalization [3]. On the other

hand, Utama et al.'s investigation examined ways digital entrepreneurship education combined with hands-on training can enhance students' chances of thriving as entrepreneurs in digital environments [4].

By collecting and analyzing 426 valid questionnaires from seven undergraduate colleges and universities in Jiangxi Province, this study revealed how digital collaboration tools can enhance students' job application, teamwork, social and critical thinking abilities, and innovation - essential competencies needed to thrive as entrepreneurs. Digital collaboration in university education helped these students better adjust to entrepreneurial demands while giving them confidence for personal success. For educational institutions and educators, the results of this study have important implications, suggesting that they should pay attention to the training and education of digital collaboration to better adapt to the needs of the modern market.

2. LITERATURE REVIEW

2.1 DEFINITION AND IMPORTANCE OF DIGITAL COLLABORATION

Digital collaboration is a multidimensional concept involving digital technologies and tools to facilitate collaboration and communication between individuals or teams. This form of collaboration includes sharing information and the process of co-creation and problem-solving through technological platforms. Digital collaboration has become a core element of modern work and learning environments as technology evolves. Van Horne and Rakedzon, in their study, emphasized the importance of soft skills for success in STEM fields, which include collaboration, communication, curiosity, and critical thinking [5]. These skills are considered critical for the 21st century and essential for students entering the workplace. This is supported by the research of Hidayatulloh and Ashoumi, who found that communication and collaboration skills directly impact the work readiness of vocational school students [6]. In terms of digital collaboration tools, Hughes and other scholars in their study explored the importance of technology-enhanced instruction in improving collaboration, communication, and critical thinking skills[7]. Digital collaboration is an umbrella term encompassing various skills and tools that play a central role in modern educational and workplace environments. By improving communication and collaboration skills, individuals and teams can share information more freely, solve issues more swiftly, and generate value more rapidly. Digital collaboration in education has become a significant trend recently, especially during the COVID-19 pandemic. In their study, Ciolacu et al. explored remote interaction and collaborative learning among e-learning students [8]. Gopinathan et al. examined the role of digital collaboration in increasing student engagement [9]. They found that digital collaboration tools, interactivity, and motivation significantly

impacted student engagement, which enhanced student engagement during COVID-19. Kaur et al. explored how technology-supported language learning (TELL) can encourage student communication and collaboration through innovative pedagogical approaches[10]. The study by scholars such as Jaipal-Jamani describes a professional development program aimed at improving teacher educators' knowledge of technology-enhanced teaching and learning[11].

2.2 ENTREPRENEURIAL COMPETENCE OF UNIVERSITY STUDENTS

Entrepreneurial ability refers to an individual's ability to identify, evaluate, and take advantage of business opportunities, including social activities and communication and coordination skills, strategic decision-making and organizational and commanding skills, pioneering and innovation and creativity, and others. With the globalization and digitalization of the economy, these skills are becoming increasingly important for the entrepreneurial success of contemporary university students.

In the contemporary educational and economic environment, the entrepreneurial competencies of university students have received much attention. Focusing on the impact of the educational reforms in Slovakia on economic education, especially on the shortcomings in entrepreneurship education, the study by Novák, J. points out that, even though the educational reforms have increased the practice-oriented pedagogical content, there is still a need to strengthen entrepreneurship education, which is crucial for the economic independence of students after graduation[12].Hopkins, C. study highlights the importance of entrepreneurial skills in different disciplines, not limited to the traditional business field[13]. Lihua D.'s study analyzed university students' entrepreneurial intentions and behaviors based on the theory of planned behavior [14]. Wu, J., & Wu, L.'s study found that students' overall scores on entrepreneurial skills assessments were low, suggesting the need for more training and education in this area [15].

3. RESEARCH METHODOLOGY

3.1 STUDY DESIGN

This study adopts a descriptive survey research method and collects data using a questionnaire. The questionnaire design consists of two main parts: its digital collaboration ability assessment, the impact of digital collaboration on enhancing university students' entrepreneurial ability, and the complex problems in developing entrepreneurial ability.

3.2 DATA COLLECTION

In this study, questionnaires were distributed to college students enrolled in seven universities in Jiangxi Province, and the questionnaires were divided into the following sections, including basic information about the students, the use of digital collaboration tools, and other aspects. All

questionnaires were anonymized to ensure the authenticity and reliability of the data. Pre-testing was conducted before distributing the questionnaires to ensure their validity and comprehensibility. Finally, valid questionnaire data were collected from 426 university students in Jiangxi Province.

3.3 DATA ANALYSIS METHODS

The collected data were first subjected to data cleaning and pre-processing to ensure accuracy and consistency. Subsequently, the data were analyzed using statistical software, mainly descriptive statistical analysis. This study will likely reveal the specific impact of digital collaboration on enhancing university students' entrepreneurial competence, including improving social activities and communication and coordination skills, strategic decision-making and organizational and commanding skills, pioneering and innovation, and creativity.

4. FINDINGS

In order to understand the exploration of the impact of digital collaboration on the enhancement of employability of college students in Jiangxi Province, we designed a questionnaire for college students from seven colleges and universities in Jiangxi Province, with a total of 12 objective questions, mainly including basic information, digital collaboration, employability, and other aspects.

The questionnaires were distributed in seven undergraduate colleges and universities in Jiangxi Province, and stratified sampling was used for data collection. A total of 426 valid questionnaires were collected. Male students accounted for 47.7 percent, female students accounted for 52.3 percent, and more details about the participants are in Table 1.

Table 1 Basic information of the sample

variant	form	frequency	per cent
distinguishing between the sexes	male	203	47.7
	women	223	52.3
age	18 years and under	34	8.0
	Nineteen.	85	20.0
	20 years old	107	25.1
	21 years old	145	34.0
	22 and over	55	12.9
Level of Institution	I	224	52.6
	II (IIa)	75	17.6
	III (IIb)	53	12.4
	polytechnic	74	17.4
professions	science and engineering as academic subjects	82	19.2
	Bachelor of Science	154	36.1
	agriculture and forestry	41	9.6
	grammar	36	8.4
	teacher-training program	41	9.6
	medical science	52	12.2
	other than	20	4.9
grade	first-year university student	72	16.9
	second-year university student	149	35.0
	third-year university student	130	30.5
	fourth-year university student	75	17.6
Level of academic achievement	talented	125	29.3
	favorable	136	31.9
	usual	131	30.8
	mediocre	34	8.0

4.1 SURVEY OF UNIVERSITY STUDENTS' UNDERSTANDING OF DIGITAL COLLABORATION

The survey data in Table 2 shows that college students' understanding of the concept of digital collaboration reaches 26.52% in the proportion of very understanding, 37.29% in the proportion of comparative understanding, 68.82% in the proportion of general understanding, and 10.50% in the proportion of no understanding, which shows that college students' understanding of the concept of digital collaboration has a high degree of

understanding.

Table 2 Survey of university students' understanding of digital collaboration

degree of understanding	proportions
Very understandable.	26.52 percent
comparative understanding	37.29 percent
usual	25.69 percent
incomprehension	10.50 percent

4.2 SURVEY ON THE DEGREE OF USE OF DIGITAL TOOLS BY UNIVERSITY STUDENTS

The survey data in Table 3 shows that in the use of digital tools in the university student population, the proportion of the group that uses them frequently reaches 26.52 percent, sometimes 37.29 percent, generally 68.82 percent, and never 10.50 percent, which shows that there is a high level of use of the concept of digital collaboration among university students.

Table 3 Survey on the level of use of digital tools by university students

usage (i.e., extent of use)	proportions
non-recurrent	30.52 percent
now and then	39.29 percent
infrequent	23.69 percent
never	6.50 percent

4.3 APPLICATION OF DIGITAL TOOLS BY UNIVERSITY STUDENTS FOR ENTREPRENEURIAL DATA COLLECTION SURVEYS

By distributing questionnaires to investigate the ability of university students to apply digital tools for entrepreneurial data collection, it is summarised that the content of Table 4 shows that among the university student group, the proportion of strongly agree reaches 28.42%, the proportion of relatively agree reaches 34.39%, the proportion of generally agree reaches 28.4%, and the proportion of disagreement is only 8.79%, which suggests that the vast majority of students can apply digital tools for entrepreneurial data collection.

Table 4 Survey on the application of digital tools for entrepreneurial data collection by university students

degree of recognition	proportions
I could not agree more	28.42 percent
relatively agree	34.39 percent
usual	28.40 percent
disagree	8.79 percent

4.4 UNIVERSITY STUDENTS' PERCEPTIONS OF ENTREPRENEURSHIP DEVELOPMENT

College students' perception of entrepreneurial ability is usually divided into three dimensions, including social activities and coordination ability, strategic decision-making ability and organizational command ability, as well as pioneering, innovative, and creative ability; according to Table 5, data shows that social activities coordination ability reaches 95.97% while strategic decision making ability reaches 95.58%; cognitive degree of pioneering creative innovative and artistic ability is relatively modest at 93.09% while their creative capacities reach only 9309% of total ability (situated as "coordinate" ability in this case). Finally, 9309 percent for the cognitive degree of pioneering creative or innovative creative capability

Table 5 Perceptions of university students on entrepreneurship development

capacity building	proportions
Critical thinking skills	95.97 percent
recruiting ability innovation capacity	95.58 percent 93.09 percent

4.5 INVESTIGATION OF THE RELATIONSHIP BETWEEN DIGITAL COLLABORATION AND THE ENHANCEMENT OF ENTREPRENEURSHIP AMONG UNIVERSITY STUDENTS

In order to explore the relationship between digital collaboration and the enhancement of college students' entrepreneurial ability, through the recovery of the questionnaire to obtain the data shown in Table 6, the proportion of the population who strongly agree that digital collaboration can enhance the entrepreneurial ability of college students reaches 26.52%, the proportion of the population who relatively agree with the proportion of 34.29%, the proportion of the population who generally agree with the proportion of 25.69% and the population who do not agree with the proportion of 13.5%, from which we believe that digital collaboration can enhance the entrepreneurial ability of college students.

Table 6 Investigation of the relationship between digital collaboration and entrepreneurship enhancement among university students

degree of recognition	proportions
I could not agree more	26.52 percent
relatively agree	34.29 percent
usual	25.69 percent
disagree	13.50%

5. DIFFICULTIES WITH DIGITAL COLLABORATION IN EMPLOYABILITY DEVELOPMENT

Although the data in Table 6 initially suggests that digital collaboration has a positive effect in enhancing the entrepreneurial competencies of university students, careful analysis of the questionnaires reveals several vital issues. Aggregated student feedback yields four main barriers to the process of employability development: the skills gap, inadequate guidance and feedback, lack of educational resources, and lack of self-drivenness.

The data in Table 7 shows that 92.54 percent of the students identified the technology gap as the main challenge in improving their entrepreneurial skills.

This indicates that students need help understanding and application challenges in digital collaboration, which may hinder them from using these tools entirely.86.19 percent of the students mentioned needing more guidance and feedback to use digital collaboration tools effectively. This finding highlights the importance of guidance in practical application and the difficulties students may encounter using these tools independently.96.09 percent of students identified the need for educational resources as a significant problem. They noted that despite the potential of digital collaboration tools, many educational institutions need adequate support due to resource constraints, leading to uneven development of entrepreneurial skills enhancement among students.94.48 percent of students indicated that a lack of self-motivation is a significant barrier to enhancing employability. Many students need more self-motivation and execution and depend on their mentors for supervision and guidance. This situation limits the potential effectiveness of digital collaboration in promoting the enhancement of entrepreneurial skills.

These findings emphasize the importance of improving students' technical understanding, providing ongoing guidance and feedback, increasing educational resources, and stimulating students' self-drive beyond the simple adoption of digital collaboration tools. Improvements in these areas will provide a solid foundation for the overall improvement of college students' employability.

Table 7 Problems with Entrepreneurship Development

Problems	proportions
technological gap	92.54 percent
Lack of guidance and feedback	86.19 percent
Inadequate educational resources	96.09 percent
Lack of self-drive	94.48 percent

6. DISSCUSSION

This research revealed the value of digital collaboration tools as essential to improving entrepreneurship among university students, echoing the findings of other studies. Ogegbo A. A., Akinrinola F Y Adegoke O, Ifekoya K, and Namusoke J et al. evaluated the digital skills of female undergraduates across four African countries and noted varying digital skills with general deficiencies and inadequate resources available[16]. Our resrach observed similar issues where students needed to possess adequate abilities to use advanced digital tools effectively due to inadequate instruction or feedback within educational environments lacking enough instruction or feedback regarding effective use.Zhao et al. conducted research at Gansu Agricultural University in China that investigated students' perceptions of digital competence; personal factors (gender, grade level, region of residence, and prior relevant training) affected self-perceptions of digital competence[17]. These results corroborate our findings that students need more self-discipline and drive before effectively utilizing digital tools.

7. CONCLUSIONS

7.1 MAIN CONCLUSIONS

By analyzing an in-depth questionnaire survey of 426 students from seven undergraduate colleges and universities in Jiangxi Province, this study accurately reveals the significant role of digital collaboration in enhancing the entrepreneurial competence of university students. The study highlights that digital collaboration tools are indispensable in improving social activities and communication and coordination, strategic decision-making and organizational command, pioneering and innovation, and creativity in the entrepreneurial process. This finding highlights the value of digital technology in education, particularly as an aid for preparing students for modern professional environments. However, several key challenges and barriers were identified during this research process, including students lacking adequate skills when using advanced tools, inadequate guidance/feedback on using such technologies effectively within educational environments, the inadequacy of educational resources needed for such technologies to function efficiently within an education setting and lack of motivation on self-drive as barriers that prevent effective use. Furthermore, students needed more self-discipline before utilizing digital tools effectively. Finally, self-drive could impede practical usage, preventing full utilization.

Overall, this research demonstrates that students can significantly benefit from digital collaboration tools in terms of improving social activities, communication and coordination skills, strategic decision-making abilities and organizational command skills, pioneering efforts, innovation, creativity, and pioneering. Online collaboration and resource sharing offer students an ideal way to develop real-world teamwork experience as well as learn effective communication and collaboration techniques. These skills are indispensable in adapting to today's ever-evolving job market, particularly within an increasingly global and interdependent workplace. Therefore, this study contributes to understanding and using digital collaboration tools as part of the development of entrepreneurial competencies.

7.2 PRACTICAL IMPLICATIONS

This study highlights the importance of digital collaboration in contemporary educational and workplace environments. For educational institutions, the results of this study provide a rationale for strengthening training in digital collaboration skills, leading to a greater focus on developing students' practical application skills. For students, this study reveals critical skills they need to strengthen to

compete in the job market.

7.3 RESEARCH SHORTCOMINGS AND FUTURE RESEARCH DIRECTIONS

The limitations of this study are mainly in the geographical and cultural scope of the sample, which needs to cover a broader range of backgrounds and educational environments. The limitations of this study are also reflected in the fact that the statistical methods needed to be more complex, descriptive statistics were used, and complex statistical methods were not used in-depth. Hence, the research methodology needs to be improved. Future research could consider more diverse samples, such as different regions or different types of schools, and more in-depth quantitative analysis methods.

7.4 RECOMMENDATIONS AND RESPONSES

Educational institutions should aim towards expanding both pedagogy and practice of digital collaboration tools so as to meet the challenges presented by today's digital era. Provide technical assistance and resources necessary for students and teachers alike to use these tools effectively, creating engaging course content designed around these tools, etc. The curriculum should emphasize practical applications and encourage students to work through projects, teamwork, and real-life case studies to deepen their technical understanding and application. Educational institutions must encourage teachers to keep updating their teaching methods with new digital platforms to keep education content up-to-date and relevant for today's student body.

Students should strive to engage in active technology usage. This requires mastering essential digital tools while at the same time developing flexibility and innovative thinking to adapt to an ever-evolving technological environment. Self-driven and executive skills development are equally vital; this will allow them to learn independently, adapt quickly to changing challenges, and use technology effectively to meet career goals in future careers.

Policymakers must implement supportive measures in order to enable educational institutions and students to use digital collaboration tools effectively and gain access to them easily. Financial assistance could include purchasing or upgrading software and hardware needed or offering professional training courses to teachers and their students. Policies must also encourage the convergence between education and technology, such as through partnerships between technology firms to introduce cutting-edge digital tools and learning platforms for classroom use, and policymakers can help foster more connected, efficient, and innovative educational environments geared toward equipping future workers with skills necessary for adaptability within today's ever-evolving digital work landscape.

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