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Scientific and Social Research

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Table of Contents

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A Research on Application of Blended Learning Mode in the Teaching Reform of Theory of Missile Guidance and Control

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Abstract: Considering theory-focused and relatively dull content of Theory of Missile Guidance and Control, and the low learning motivation and weak practical skills of the students, this paper describes the practice and experience of blended teaching reform in the course. A comprehensive analysis was done on real demands of students' ability, the nature of the course and characteristics of content. The teaching idea of building a solid foundation, emphasizing on the operation of the of equipment, actual combat, and the development of equipment was applied. In order to improve the students' abilities and their understanding of the subjects, a new blended teaching mode for the theoretical course of equipment was explored, so as to form an evolving cycle of "theoretical study, hands-on practical, and forming new abilities," spark the students' interest in learning, and cultivate new thoughts in autonomous learning and innovative practice. This teaching mode has been practiced for a few years and is shown to be effective in improving the ability of students and the quality of training for personnel of military technology. Therefore, it can be used as a reference for curriculum reform of courses involving equipment.

Keywords: Blended; Teaching mode; Course reform; Guidance and control

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1. Introduction

With the rapid development of network and multimedia technology, information technology have been more and more widely used in teaching [1-2]. The online courses constructed by the government, colleges, and universities provide a good platform for students to study independently [3-4]. In traditional teaching, more focus is placed on the teachers' teaching and downplays students' independent learning which has been a great challenge to be overcome [5-6]. Blended teaching combines the advantages of both traditional classroom teaching and online learning, which has in away make up for the deficiencies of simple face-to-face courses and simple online teaching. At the same time, this mode fully reflects the initiative, enthusiasm and creativity of students as the main body of the learning process, and can better improve the learning ability of students [7-9]. Therefore, the teaching team to which the author belongs to takes the Theory of Missile Guidance and Control as the pilot course and adopts the blended teaching mode to carry out the course reform.

Theory of Missile Guidance and Control is a required course for undergraduate majoring in Missile Measurement and Control Engineering, which is the theoretical basis of navigation guidance and control, aerospace defense system engineering and other disciplines. This course closely focuses on guidance and control technology, the core missile technology that ultimately result in combat effectiveness in the air

defense missile. The course involves fluid mechanics, flight mechanics, control theory, guidance technology and other contents, requiring students to have a profound theoretical foundation of mathematics and physics [1]. In the past, because of the relatively dull course content, with too much mathematical theory derivation, students have low interest in learning and are unenthusiastic, and the effect of learning is not ideal. At the same time, the theory teaching is not well-connected to the use of equipment, resulting in the students' low ability in analyzing and solving practical problems of different equipment. These problems seriously restrict the effect of practical lessons and hampers the improvement of training quality of equipment personnel in the new era. Based on the existing problem in the teaching of this course, our team designed a military course with high quality. Our team took the opportunity to carried out the reform of blended teaching mode in Shaanxi Province. In view of the urgent needs of practical personnel training and military post capacity, we vigorously strengthened the comprehensive construction of the course, dynamically updated the teaching content, perfected the supporting teaching resources, optimized the teaching methods and means, actively explored the application of blended teaching mode in Theory of Missile Guidance and Control, and changed the traditional teaching mode. After implementing this new teaching mode for nearly five years, a positive effect was achieved.

2. Highlight the main position of students, and reasonably choose teaching methods and means

In the teaching process, in view of the course involving many concepts, being very theoretical, and the need for improving students' ability in operating different equipment, we applied the teaching idea of "solid foundation, and emphasizing on equipment, actual combat, and development of equipment." We closely integrated the development of new air defense and missile defense equipment, centering on the innovation of curriculum teaching mode, optimizing teaching content continuously, and meeting the "four characteristics" (pertinence, systematization, practicability and effectiveness) of curriculum teaching. The innovation of teaching methods and means of "multi-form combination, multi-method synthesis and multi-means combination" was used as the starting point, and the reform of curriculum teaching assessment and evaluation mechanism acted as the foothold. The linkage reform was carried out around the core elements of curriculum reform, and the construction of a new curriculum teaching mode with distinctive characteristics and high application efficiency was explored.

2.1. Regard learning as the main body.

The principal position of students was strengthened and their awareness of innovation and independent learning ability were raised. In the teaching process, the concept of "determine the learning objectives, find out difficulties, experience self-directed learning, construct the cognitive structure of independent study, learn to conduct self-assessment," was applied, so as to fully arouse interest and motivation in learning. A closed loop of teaching through "goal guidance – difficulty analysis – self-learning – self-evaluation" was formed, so as to change the mindset of students from "learning because they are asked to" to learning willingly.

2.2. Enrich teaching means.

Combined with the specific teaching content, diversified teaching methods were adopted to improve the classroom teaching effect. By using the advantages of information technology, the dynamic characteristics of missile guidance and control system were demonstrated through animation. The doubts and difficulties faced students while they are self-studying were resolved through online communication during the online classes. Through the collection and analysis of different cases, the students' enthusiasm for learning was stimulated, and the combination of technology, equipment and operations is completed. Through the experiment and practice of combining all kinds of virtual software and actual equipment, it helps students

analyze the characteristics of all kinds of guidance and control methods, and helps in cultivating students' scientific literacy. Through the revolutionized classroom teaching, part of the learning process was done outside the classroom, so as to make full use of the classroom time for positive interaction, in-depth learning, and to stimulate students' independent and innovative thinking abilities. Through rational use of a variety of teaching means, learning was made more fun, and the initiative of students for learning were stimulated.

2.3. Reasonable use of teaching methods

"Five-star" teaching method, contrastive teaching method, inquiry-based teaching method, problem-based teaching method, heuristic teaching method, case teaching method, project teaching method and other teaching methods were used comprehensively. Contrastive teaching method was mainly applied in the teaching of different guidance methods, guidance systems and control methods, which helped in avoiding confusion through pointing out differences. Inquiry-based teaching method was implemented in small groups. Principles were analyzed layer by layer in order to understand the essence of guidance and control theory. Problem-based teaching method is mainly used in explaining concepts, working processes and working principles of various guidance laws and guidance control methods. Through the idea of setting the problem by analyzing concepts and elements, eliciting the problem by analyzing working process, and solving the problem by analyzing working principles, different problem chains are formed and a knowledge system is constructed. The teaching methods should be adopted reasonably according to the characteristics of different contents, and the diversity of teaching methods should be increased.

2.4. Using the teaching effect to evaluate the blended teaching mode

In order to better test the teaching effect, seven modules including network self-study module before class, self-test module of exercises before class, discussion or forum module before class, classroom activity participation module, teaching content test module, completion module of homework after class, mutual evaluation and self-evaluation module were used to generate real-time statistics of students' learning dynamics, grasp the learning effect of students in time, and give play to the leading role of teachers in guiding, inspiring and monitoring the teaching process. Through online and offline Q&A, in-class and out-of-class guidance, theoretical analysis and experimental operation, etc., the teaching shortcomings were are made up for and the teaching effect was improved. Moreover, through questionnaire surveys and the surveys done on the military, the feedback results of teaching effect on the abilities on military personnel of the were understood. Improvements were made after analyzing the feedback on the effect of the new teaching mode.

The teaching team adhered to the teaching concept of "learning as the main body and teaching as the guide," and adopted a variety of teaching methods and means by combining specific teaching contents, so as to stimulate learning interest and improve learning effect. The teaching methods were further optimized through collecting and analyzing feedbacks, further enhancing the "teacher teaching-student learning-teaching inspection-teaching reform" link, and provide a basis for curriculum teaching innovation and practice.

3. Focus on the demands of equipment support ability, and explore and practice the teaching mode of "combining three practical ways of teaching and four combinations"

The course closely focuses on the guidance and control theory of surface to air missile, which is the core of the technical support of surface to air missile force, and also the key to form combat effectiveness of air missile weapon system. In order to develop the students' ability in certain military positions, operate and analyze and solve practical problems, the teaching team put forward the blended teaching mode of three practical ways of teaching and four combinations. Three practical ways means starting from the actual

combat needs of troops, relying on actual equipment, using experimental technology as means, and using actual cases for teaching. Four combinations mean combination of online teaching and offline teaching, combination of software and hardware, combination of virtuality and reality, and combination of in-class learning and out-of-class learning. Through this kind of blended teaching mode, the application characteristics and professional characteristics of surface to air missile weapons are highlighted, the latest scientific research results are introduced into the teaching timely, and the teaching is combined with the real armament, so as to increase the students' perceptual understanding and intuitive experience.

3.1. Three practical ways of teaching

(1) Real equipment

The "Theory of Missile Guidance and Control" course involves many types of missiles and has a clear background of theoretical engineering application. In the course of teaching, specific types of equipment are combined to carry out teaching, which gives students an intuitive impression. For example, in the teaching process of different guidance systems, such as remote-control guidance and homing guidance, basic working principles were taught using real missile components; guidance and control signal flow was taught in combination with the missile's internal structure, and core components and electronic circuits were clearly described. The influence of guidance and control system on weapon system performance index was analyzed to strengthen the connection between theoretical learning and practical equipment application.

(2) Experiments

In view of the characteristic of theory of missile guidance and control, and the big difference between different guidance methods and control methods in experimental phenomenon, experiment teaching needs to be carried out. Students set experimental conditions under the guidance of the instructors, carry out the required experiments and record their observations. The instructor leads the students to explore the nature of the experiments, step by step, and summarizes the characteristics of different guidance and control methods. Through the experimental teaching, the students' hands-on programming ability and simulation analysis ability are cultivated, which lays a foundation for the learning of equipment theory.

(3) Real cases

Real case teaching refers to the use of actual cases of target shooting and equipment maintenance & support. Learning is improved by compiling and selecting the equipment failure and combat cases related to guidance and control, which are authentic, complete, typical and enlightening, and connecting them closely with the course content, the pertinence and effectiveness of guidance and control principle. The problem-solving skills of students are developed through observations in of practical cases, performing and in-depth analysis of the experimental results relating to the principle.

3.2. Four combinations

(1) Combination of online teaching and offline teaching

In the informationized teaching environment, online teaching and offline teaching are deeply integrated. Classroom teaching is organized according to three links: before class, during class and after class [10]. Before class, with the help of the online teaching platform and the school's key curriculum construction platform, teaching tasks are released in advance, teaching materials are uploaded, and preview guides are provided. Teachers then make classroom teaching plans according to the students' preview conditions. Then, targeted teaching is carried out according to the students' preview situation, and a variety of teaching methods are utilized to break through the key and difficult content. After class, students finish their homework, and conduct online evaluation and course preview on the network

teaching platform. Through the combination of online and offline methods, students' autonomous learning ability can be cultivated and teaching efficiency can be improved [11].

(2) Combination of software and hardware

Software resources such as "auxiliary demonstration platform for guidance and control system," "classical guidance rule platform" and "missile electric steering gear control system" were introduced into classroom teaching. Software simulation provides a platform for the performance analysis of guidance rules and control rules, provides an analysis tool for students to distinguish the performance of different guidance methods and control methods, and lays a foundation for in-depth understanding of guidance and control theory. The actual equipment, such as the missile rudder system and seeker system, can reproduce the combat state of the missile through the setting of software parameters, which can provide intuitive impression for students to understand the working principle of the guidance and control loop under different guidance systems. Through the combination of software and hardware, the students' ability to form good programming and equipment operation are developed.

(3) Combination of virtual simulation and reality

Considering that the number of actual missile equipment in the main campus of the school is limited, the virtual equipment in the simulation training center should be fully utilized, and the teaching mode of combination of virtual and reality is adopted, which is "from the real-life to virtual, from virtual to real-life, and get familiar with the real-life + virtual mode." In the case of practical installation, the instructor verifies the relevant guidance and control theory, so that the students can understand the application of principles. When there is no practical installation, the simulator is used for verification and analysis to master the practical engineering application of guidance and control theory. Through the combination of virtual simulation and real-life practical installation, the students can master the basic theory of surface to air missile guidance and control.

(4) Combination of in-class learning and out-of-class learning

The students' extracurricular time, scientific and technological innovation, military practice, comprehensive drill, live firing and other activities will be combined with in-class teaching, carefully organized and arranged, and the maximum support and help will be provided to the students in terms of venues, instruments and equipment. Build a "learning as the main body and teaching as the guide" ability generation platform and open experimental platform, encourage students to learn through online resources by using extracurricular time, and find out any misunderstanding they have about the topics, and have their questions resolved during the lessons. At the same time, extracurricular scientific and technological innovation needs to be regarded as an extension of in-class teaching, carrying out some high-level research experiments. In this way, the students' autonomous learning ability and hands-on ability can be developed.

4. Strengthening of the links of operation and practice, and all-round consolidation of students' ability base

Practical operation is an important way for students to improve theoretical cognition, which can effectively stimulate innovation and develop practical ability [12]. Course teaching includes observation, cases, independent experiments, project introduction, program design, equipment demonstration and other diverse teaching activities. Students can have direct knowledge and understanding of the working principle of the missile guidance and control system, which is conducive to the close combination of the guidance and control theory with the application of weapons and equipment. The application of course teaching is mainly reflected in the four following aspects:

(1) Actual equipment application practice

According to different guidance systems, combined with specific missile equipment components and electronic wall charts, the circuit structure and working principle of guidance and control system are explained in practice. By inputting instructions, setting parameters and changing conditions, the students can drive the rudder system, seeker system and other equipment to work in real time, intuitively feel the working process of the missile guidance and control system, and further understand the basic theory of guidance and control.

(2) Participating in the practice of scientific research projects

Curriculum teaching team can introduce the research projects, such as the national natural science funds, aviation funds, weapons and equipment pre-research project, into course teaching. The guidance and control theories and methods closely related to the teaching content of the course can be selected to condense the small topics suitable for undergraduate students, and clarify the research background, technical route and research objectives. Through the introduction of the project teaching, high-quality teaching objectives can be achieved, algorithm design ability and simulation analysis ability of students can be improved, good scientific literacy and rigorous scientific attitude of students can be cultivated, and independent innovation ability of students can be stimulated.

(3) Experimental operation practice

The course is set up with 6 simulation experiments. The characteristics of classic guidance and control algorithms can be analyzed by using the simulation platform of all-digital guidance and control system, and suggestions for algorithm improvement can be put forward. By using the guidance control loop hardware-in-the-loop simulation platform, the influence of the guidance parameters on the output of the equipment is analyzed. Through the organic combination of these software and hardware systems, the students can improve their understanding of the working principle of the seeker, steering gear and other equipment in the guidance and control system, cultivate their software and hardware application ability, and improve their practical ability and analytical ability.

(4) Case teaching practice

Through real cases such as target shooting and missile failure, students are guided to explore the essence behind the surface phenomenon of cases. Through in-depth analysis, students can make clear the influence of guidance and control system on the whole missile operation process, and learn to use the guidance and control theory to analyze problems in the case. Through case-based teaching, students are encouraged to learn independently and actively, and is able to master the methods of analyzing and solving problems, and enhance the predictability of future work.

5. Application and practical effect

In the process of curriculum reform practice, by updating the teaching idea, the teaching mode “three practical ways of teaching and four combinations” effectively expand the depth of teaching about the Missile Guidance and Control Theory, so as to inspire the students learning interest and enthusiasm, significantly improve the students’ ability of meeting their job requirements and quality, and improve the quality and efficiency of equipment principle teaching. This course provides strong support for subsequent equipment operation courses. Students can flexibly combine basic theories with practical equipment, laying a solid foundation for equipment troubleshooting.

Since the blended teaching mode was adopted in the course of Theory of Missile Guidance and Control in 2016, satisfaction rate of student has increased from 63.5% to 91.6%. The statistical results show that in the past five years, the pass rate, good rate and excellent rate of students’ examination results have been greatly improved, and the quality of teaching and the level of students' knowledge and ability have been significantly improved. The improvement of course teaching effect has laid a good foundation for subsequent equipment operation courses, and the maintenance and support ability of missile guidance and

control system has also been greatly improved. At the same time, this course has set up innovative practice activities for students, which greatly stimulates the students' creativity and enthusiasm, and improves the students' ability to take initiative. Students actively participate in the National Robot Competition, China Education Robot Competition, Electronic Design Competition, China Computer Game Competition, and various national hardware and software competitions. In the past five years, students who attended this course have won 16 national special prizes, 37 first prizes and 62 runner-up prizes, which further verifies the effectiveness of the teaching mode.

At present, the reform of blended teaching mode based on the combination of "three practical ways of teaching and four combinations" has become a bright spot in the course construction of equipment principle of missile measurement and control engineering specialty, which has greatly improved the level of curriculum and discipline construction. Since 2016, the course has been rated as the top construction course of the university and the top construction course of Shaanxi Province. The Measurement and Control Engineering major has been successfully approved as the provincial pilot professional comprehensive reform project, and the course teaching team has been awarded the Provincial Teaching Team of Universities in Shaanxi Province. In the past five years, the teaching team members have won more than 10 prizes, such as Provincial First Prize, School First Prize, School Runner-up Prize, and Teaching Achievement First Prize. The demonstrative course designed based on the blended teaching mode won the national second prize in the National Vocational Education Information Teaching Competition in 2017 and the first prize in the Provincial Classroom Innovation Competition in 2020, which was unanimously recognized and praised by experts.

6. Conclusion

The reform of course teaching mode is a systematic and long-term work, which should be targeted at the abilities needed for military posts. The law of talent development needs to be followed based on the current situation of software and hardware teaching guarantee in schools, the characteristics of students' knowledge and needs need to be taken into account. Through the reform of blended teaching mode, the initiative of students should be brought into full play, and should be fully mobilized to change passive learning into active participation. At the same time, through the reform, it has strengthened the communication and training of teachers, guided and encouraged young teachers to devote themselves to teaching and actively participate in teaching research and reform, therefore greatly improving the quality of the teaching team. Therefore, as a continuous innovation of classroom teaching, the reform of blended teaching mode can provide students with services beyond the existing education and teaching system, and can also provide more room for the development of teaching team. Exploring the application of blended teaching mode of "three practical ways of teaching and four combinations" in the course of Theory of Missile Guidance and Control can provide reference for the teaching of other equipment principles. In the future, the teaching team will further study the application of blended teaching mode based on the full network coverage environment constructed by the school, utilize modern information technology, combine development of online course of the Theory of Missile Guidance and Control, and explore new methods and ideas of reform dominated by teaching effects.

Disclosure statement

The authors declare no conflict of interest.

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Exploring the Path of Education Development in Border Ethnic Areas in the Context of the New Era

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Abstract: In the context of the new era, the development of education in border ethnic areas can help stimulate the awareness of self-development of border ethnic groups, enhance endogenous development, promote the transformation of old and new dynamics of economic development, and achieve the goal of high-quality development in the new era. A long-term national strategy, the "Enrich the Borders and the People of the Borders Action" has effectively improved the infrastructure construction and living standards of people living in China's border areas over the past 20 years. It has immensely promoted industrial restructuring, advanced the construction of the "Chinese national community," and laid a solid foundation for poverty eradication and the overall actualization of a well-off society. However, we also clearly understand that the border areas are passively performing "blood transfusion" to alleviate poverty. Most of the border areas in China are ethnic areas and relatively poor. This paper attempts to explore the education for the ethnic minorities in the new era of socialism with Chinese characteristics to actualize the development of border areas from passive "blood transfusion" to active "blood creation" development to stop the intergenerational transmission of poverty and promote the sustainable development and modernization of China's border areas, and ultimately achieve the goal of high-quality development of border ethnic areas.

Keywords: New era; Rural revitalization; Developing borders and enriching people; Ethnic education; Fostering will and wisdom

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1. Introduction

China has the largest number of land neighbors, bordering more than 10 countries, with 22,000 kilometers of land borders, 19,000 kilometers of which are in ethnic areas, and about 50 percent of people who live along the borderlines are ethnic minorities [1]. The stability and prosperity of the border areas not only affect the consolidation of China's border defense and national unity, but also have a bearing on the high-quality development of the "Five-in-One" in the new era. With the promotion of rural revitalization, the Central Government has repeatedly emphasized the "five major revitalizations," namely industry, talent, culture, ecology, and organization as the specific action direction and realization path [2]. The Central Document No. 1 of 2021 points out that "to revive the nation, the countryside must be revitalized." The border areas of China are plagued with geographic variations, harsh natural environment and insufficient resource endowment, and ethnic areas are the focus and difficulty of rural revitalization in China.

In 2000, the Party Central Committee launched campaign named the "Enrich the Borders and the People of the Borders Action" with the goal of "enriching the people, promoting the borders, strengthening the country and establishing good relations with the neighbors." This is to promote the development of China's border areas, upgrade the areas, and narrow the gap between the economic and social development

of China's border areas and those of the southeastern coastal areas. Over the past 20 years, the Action has achieved tremendous success, effectively improving the social and economic development environment in the border areas. The industrial structure has been developed in a positive way, significantly raising the living standards and disposable personal income of people living in China's border areas (hereinafter referred to as border people) and promoting the cause of national unity. However, there is still a long way to go to achieve modern development in the border areas, and the problem of the relative lagging of economic and social development in the border areas has not yet been fundamentally changed, owing to a number of subjective and objective factors, including geographical constraints, uneven economic development, low average number of years of education, insufficient knowledge of professional and technical skills, and low market awareness.

In the report of the 19th Party Congress, the Central Government clearly proposed: "Adhering to the poverty alleviation pattern, focusing on the combination of poverty alleviation with helping the will and wisdom, and deeply implementing the East-West poverty alleviation collaboration" [3]. As a major tool for poverty alleviation and poverty eradication in border areas, the "Action for Promoting the Border and Enriching the People" has successfully alleviated material poverty. However, in order to "treat the root causes" instead of "treating the symptoms," the people in border areas needs to be motivated, using education as the guide to achieve "spiritual poverty alleviation." To achieve "spiritual poverty alleviation" in the light of the aforementioned issues, this paper intends to explore the path of education development in border ethnic areas in the context of the new era.

2. Literature review

In an article by Xu Zidong and Guo Ying, "Fostering Will and Wisdom in the Action of Promoting the Border and Enriching the People: the Current Situation, Problems and Countermeasures," they believe that in the action of promoting the border and enriching the people, we should establish and strengthen the willpower, and increase, promote, and use wisdom appropriately in the process of promoting the border and enriching the people through the development of education for ethnic minorities [4] . The border areas in China are mostly relatively poor areas, so Zuo Mingzhang, Xiang Lei, and Ma Yunpeng proposed in their article "Helping the Will, Helping the Wisdom, and Helping the Learning: the Construction of the 'Trinity' Model of Information Technology for Precise Poverty Alleviation in Education" that by clarifying the objects and effects of "fostering willpower and wisdom, and increasing learning abilities," we can alleviate poverty through education. In the same way, the endogenous logic of "trinity" and the realistic purpose of "one matching and two combining," a "trinity" model and action framework of education informatization for poverty alleviation through education can be constructed. The "trinity" model and action framework for education informatization for precise poverty alleviation [5]. The border areas are mostly ethnic areas, and Song Caifa and Pan Shanbin mentioned in their "Legal Discussion on Improving the Poverty Governance System in Ethnic Areas" that in order to achieve economic and social revitalization in ethnic areas, we should attach great importance to the development of education in ethnic areas and improve the quality of education in ethnic areas [6]. Zhang Lijun and Su Lanxin in "Research on the Construction of Cultural Industry in Southwest Land Border Crossings" proposed that border crossings should develop a targeted talent construction mechanism of "talent attraction + local training + skill training" and build a joint training mechanism of "government + university" [7]. The above literature provides important inspiration and ideas for the writing of this paper.

3. The brilliant achievements of 20 years of the "Enrich the Borders and the People of the Borders Action" lay the foundation for the development of education in border ethnic areas in the new era

In 2000, the "Enrich the Borders and the People of the Borders Action" came into being as a national

strategy to realize the common prosperity and development of border areas. Over the past 20 years, the movement has been implemented in conjunction with industrial poverty alleviation, education, and cultural poverty alleviation, as well as a series of development strategies such as the "B & R" strategy and the "Western Development Strategy." It has been closely integrated with a series of development strategies such as the "B&R" strategy and the "Western Development Strategy," forming a policy synergy that has led to the revitalization of China's border areas in terms of infrastructure, economic construction, ecological construction, culture and education, social construction, and other aspects, and has substantially realized the enrichment of people in China's border areas.

In terms of infrastructure, the initial formation of a transportation network in the border areas and the improvement of traffic and road conditions in Yanbian towns and villages have made travelling easier for the people and the borders and to lay the foundations for economic development. In terms of economic construction, firstly, the rich ethnic cultural resources are used to vigorously develop the tertiary industry, mainly cultural industry, to broaden the income channels of the border people and ease the pressure of employment. Secondly, the resources can be integrated to promote the development of special agriculture, animal husbandry and fishery according to local conditions, and optimize the structure of the primary industry, so that the border people can increase their income. Thirdly, with the "Western Development Strategy" and "B & R" strategy, the advantages of the border can be maximized and the trade with neighboring countries can be strengthened. Besides, with the support of policies, the establishment of border economic cooperation zones and overseas economic and trade cooperation zones will provide new "growth points" for the economic development of China's border areas. In terms of social construction, the level of livelihood protection in the border areas has been continuously improved. The civil affairs projects under the "Enrich the Borders and the People of the Borders Action" have improved the social environment in the border areas in terms of culture, entertainment and medical care, and the establishment of libraries, museums, cultural centers, and medical clinics has solved the problem of difficulties in accessing medical care for the border people and enriched the spiritual world of the border people [8]. In terms of culture and education, the border areas have increased expenditure on education and adopted a project-oriented model, in line with the "Outline of the National Medium- and Long-term Education Reform and Development Plan (2010-2020)," the "Outline of China's Rural Poverty Alleviation and Development (2011-2020)," and the "National Development Plan for Rural Areas (2011-2020)," "the Thirteenth Five-Year Plan for Education to Fight Poverty," and the "Implementation Plan for Education to Fight Poverty in Deeply Impoverished Areas (2018-2020)," increasing the number of schools in border areas, improving the environment of school facilities in border counties and towns, and raised the number of teachers per student. The biggest shortcomings constraining the balanced development of education in border areas have been gradually resolved, laying an important foundation for the development of education in border ethnic areas.

In 2020, China has achieved a victory to break the circle of poverty and has built a moderately prosperous society. China has entered a new era of socialism with unique characteristics. At the intersection of the two centuries of history, the "Enrich the Borders and the People of the Borders Action," as an important vehicle for the national governance of border areas, will uproot the backwardness of border areas, ensure permanent poverty eradication, and promote the comprehensive high-quality sustainable development of border areas. The development of education in border ethnic areas is an important support for the sustainable development of border ethnic areas in the new era.

4. The significance of developing education in border ethnic areas in the new era

Maslow's Hierarchy of Needs theory is well-known [9], the 5-level model of human needs from the bottom to the highest level are: physiological needs, safety, love and belonging needs, esteem, and self-actualization. 20 years of implementation of the "Enrich the Borders and the People of the Borders Action,"

has helped the people in the border areas to meet their physiological needs, security needs and belonging needs, i.e. the material aspect of prosperity of the border and enrichment of the people has been achieved. But there is still a need to realize the spiritual aspect of enriching the people, that is, the need for esteem and self-actualization. Together with the material aspect, it constitutes the complete prosperity of the border. The essential difference between the material and spiritual aspects of enriching the people is that the spiritual aspect of enriching the people needs to be realized by cultivating the endogenous driving force, and the enrichment of the people in the new era needs to be realized from "blood transfusion to poverty alleviation" to "blood creation to poverty alleviation" by "fostering willpower and wisdom." In the new era, it is necessary to transform from "blood transfusion to poverty alleviation" to "blood creation to poverty alleviation" by "cultivating will and wisdom," and to stimulate the endogenous driving force of "self-reliance, striving for improvement, and hardworking" attitude of the border people.

The basic lesson of the world's poverty alleviation is that "lack of education is a deeper form of poverty than economic poverty and is the main cause of intergenerational poverty transmission" [10]. While further consolidating the existing achievements in enriching the people, it is necessary to break the constraint of raising the border due to weak educational resources. In the new era, it is necessary to take "fostering willpower and wisdom" as the guide and develop education as the support. The development of ethnic education has been used to block the intergenerational transmission of poverty in border areas and to promote the formation of "a firm sense of Chinese national community among people in border areas".

5. Exploring the path of education development in border ethnic areas in the new era

The Central Government pointed out in the report of the 19th Party Congress that China has entered a new era of socialism with Chinese characteristics, and that the main social contradiction is no longer "the contradiction between the people's growing material and cultural needs and backward social production," but "the contradiction between the people's growing need for a better life and unbalanced and insufficient development" [3]. The fundamental change in the main social contradiction represents a change in the fundamental task of governance in the border areas and the way of thinking in solving problems. By establishing a "precise" education system that provides education services according to the needs of the people in the border areas, the awareness of self-development of the people in the border areas can be cultivated, the internal development momentum of the border groups can be enhanced, and new "growth points" can be explored for the development of the border areas. In turn, it will drive the sustainable development of the economy, society, industry and national unity in the border areas and realize the "development of the border and enrichment of the people." This is a new task and a new idea of the action to develop the border and enrich the people in the new era.

5.1. Increase the proportion of children at the border areas receiving education

According to the article "Analysis of the Causes of Cross-Border Ethnic Education Problems in Guangxi and Ways to Solve Them," the consolidation rate of nine-year compulsory education in Yunnan-Guizhou-Guizhou rocky desertification area was 9.8% lower than the national average in 2017 [11] , and according to "Research on the mechanism and path of precise poverty eradication in ethnic areas with special industries," the national average of illiteracy in 2016 was 5.28% of the population over 15 years old, while the eight ethnic provinces and regions were 11.79% , with Tibet as high as 41.12% [12] . While children are the future of the motherland, compulsory education is an important cornerstone of national revitalization, social progress and national unity. Efforts to enable every child in the border areas to enjoy fair and quality compulsory education is the backbone of development for the prosperity of the border and the people. The 14th Five-Year Plan for Education mentions that by 2025, the enrollment rate of primary school and junior high school-age children is expected to reach 100 percent, and the consolidation rate of nine-year

compulsory education is expected to reach more than 98 percent [13] . Border areas should make full use of policy synergies to bring more border children into schools and increase the proportion of children in border areas receiving compulsory education.

5.2. Ethnic-specific vocational education to help the sound development of special industries in border areas

"High-quality development" has replaced "high-speed growth" as the direction of China's economic development in the new era. Using ethnic, cultural and natural resources in border areas, cultivating and developing high-quality special agriculture, animal husbandry and fishery industries and special cultural industries is a high-quality choice to achieve sustainable economic growth and poverty alleviation in border areas. However, the lack of cultural consciousness, professional skill talents, management knowledge, and market concept lead to the lack of motivation for the sustainable development of special industries in border areas. Most of the border areas in China are ethnic areas, and ethnic areas are characterized by different cultures, resources and customs. Vocational education, especially higher vocational education, as one of the main carriers of education for poverty alleviation, plays a role of intellectual support in China's economic and social development. Since 2020, higher vocational colleges and universities have started to implement a "million expansion plan" to nurture 2 million students in two years through the implementation of classified examinations, and priority is given to students from poor families [14]. With a long-term perspective, vocational education in border areas should be developed by integrating the culture and industries with ethnic characteristics of the region and adopting the training method of "professional skills + ethnic culture." Make full use of the National Implementation Plan for Vocational Education Reform to "strengthen the foundation for students' sustainable development, encourage students in vocational colleges to obtain multiple vocational skills certificates while obtaining academic certificates, and expand their skills for employment and entrepreneurship" [15], and adopt the joint cooperation model of "local universities + local enterprises + government." The cooperation model of "local universities + local enterprises + government," with the local government promoting school-enterprise cooperation and establishing a 1+X certificate training platform, realizes the cultivation of skilled talents "according to ethnicity" [16], and achieves the goal of "creating blood to alleviate poverty".

5.3. Establishing a system for further education and training in collaboration with local universities according to the needs of working staffs

Some cadres and border people in border areas have different degrees of knowledge and skills shortage. This lack of knowledge and skills has led to old-fashioned ideology, misunderstanding and low awareness of development among some cadres and people in the border areas, and even the idea that some poor people are "proud of being poor" and are waiting for government assistance [6]. These situations largely affect the enthusiasm of the border people to participate in economic and social development and build a better homeland. At the same time, it also concerns the stability of China's border defense, and more importantly, the common prosperity of the majority of border people. The governments of border areas should make full use of the continuing education resources of regional universities, adopt the cooperation model of "government + university" and jointly establish a mechanism for continuing education and training. Taking into account the development needs and cultural characteristics of the border areas, training and lectures on professional skills, management knowledge and national unity should be conducted on a regular or irregular basis according to the needs of the border areas. This is to supplement the professional skills and management knowledge urgently needed by some cadres and border people, and at the same time to promote the formation of "a firm sense of Chinese national community among the people of the border areas."

5.4. Improving the quality of facilities and making use of various preferential policies and establish a framework to attract more staffs

From the perspective of the number of teachers and the structure of teaching, schools in border areas have long had a weak and unstable teaching force, and at the same time, it has been difficult to retain capable staffs [17]. This has led to a reduction in the sustainability of education. In the new era, the governments of border areas should adopt various preferential policies and create various positive conditions to open various channels for the introduction of talents and stimulate and guide the flow of various professional talents to border areas through various channels such as teaching support, border support, schools and border units. Colleges and universities should encourage university graduates to join the "border-raising" team. In addition, to give full play to the synergy of policies, the 14th Five-Year Plan for Education has made efforts to strengthen the construction of teachers, as stated in its key projects and major issues: optimizing the allocation of teacher resources and alleviating the contradiction of teacher shortage in rural areas. In December 2021, when the Department of Higher Education of the Ministry of Education introduced the revitalization of higher education in central and western China, it was pointed out that in the future, a comprehensive platform for higher education innovation will be built in the three regions of northwest, southwest and central China to share high-quality education, research, and talent resources. A platform for mutual support from universities in the east, central, and west will be established to implement counterpart support precisely. In this way, the endogenous power and development vitality of higher education in central and western China will be stimulated. The northwestern and southwestern provinces are mostly border provinces and regions, and these policies and measures will provide strong talent support for economic revitalization and social revitalization in border areas.

5.5. Making the most out of the opportunities offered by digital technology and new infrastructure development to develop education in border ethnic areas

The new technological revolution led by digital technologies such as the Internet, 5G, big data and artificial intelligence differs from previous technological revolutions in that digital technologies are not the change of a single technology, but the convergence and development of a series of technologies. By breaking time isolation and spatial division, digital technology in turn gives rise to new industries, new models and new production. With the integration of digital technology and industry, border ethnic areas should put more effort in introducing various types of technical talents that are in short supply in local digital construction, and on the other hand, cultivate a team of local digital talents. At the same time, the "Internet+ education" should be actively promoted to accelerate the construction of education informatization. Using the unique advantages of education informatization, such as breaking through time and spatial restrictions, rapid replication and dissemination, and various means of presentation, we will promote the equitable and balanced development of education in border ethnic areas and effectively improve the quality of education [18].

6. Conclusion

The implementation of the "Enrich the Borders and the People of the Borders Action" has been effective in promoting the economic and social development of our border areas, significantly improved the living conditions of the people in the border areas, enhanced the people's sense of national unity, and laid a solid foundation for the overall building of a well-off society. While rejoicing in the great achievements that have been made, the problems of unbalanced and insufficient development in the border areas are still prominent. In the new historical development period, the "Enrich the Borders and the People of the Borders Action" should focus on improving the education system that varies from industry to industry, from culture to culture, and from nationality to nationality as it continues to promote economic development, social

development, development of special industries, and development of ethnic culture in the border areas and strengthen the sense of national unity. Through the construction of an education system tailored to local conditions, the shortcomings that limit the unbalanced and inadequate development of border areas due to the lack of endogenous motivation will be made up. Education can be used to "build willpower and gain wisdom," to stimulate the border people to "seek willpower and wisdom," to achieve self-development of the border people, and ultimately to truly realize the high-quality development of China's border areas in the new era, and to achieve prosperity and stability of China's border areas as well as the whole country.

Disclosure statement

The author declares no conflict of interest.

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The Core Stakeholders' Identification and Analysis of Community Micro-Renewal Based on the Chinese Context

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Abstract: Urban renewal has become an important issue of sustainable urban development, and community micro-renewal is the basis of urban renewal. More and more grassroots governments begin to pay attention to and introduce policies to guide the development of community micro-renewal. Considering the actual situation in China, based on the stakeholder theory, this paper analyzes the characteristics and composition of the core stakeholders from three dimensions: environmental improvement, space building, and infrastructure construction, as well as their role in the community micro renewal, aiming to provide the basis for the relevant government departments to correctly understand the demands of different stakeholders and create suitable policies.

Keywords: Community micro-renewal; Urban renewal; Stakeholders; Chinese context

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1. Introduction

China has experienced a rapid urbanization process since the reform and opening up [1]. However, because local governments emphasized too much on speed of urban development, the problem of "spread pancakes" in urban construction is becoming increasingly prominent. Although urbanization is increasing, the lack of investment in management and maintenance of older metropolitan areas has led to difficulties with the infrastructure in meeting residents' needs [2], and consequently accelerated the aging of community resources and impoverished living conditions. Fortunately, the local governments have identified the problem and begun focusing on urban organic renewal and recognized that community micro-renewal is an important part of this work.

The main feature of community micro-renewal is being "people-oriented" [3] which includes improving community infrastructure and environment; with a design mechanism of resident participation in organization and management. In 2020, more than 14 million households in China required community renewal [4]. A more prominent role for resident participation in community renewal is also needed [5]. Residents' preferences and behaviors significantly impact government decisions [6]. Therefore, it is important to understand the composition of the participants in community micro-renewal and their relationships and economic interests.

2. Governance subjects in the community

To better understand the relationship between the core stakeholders, this paper introduces firstly the

community governance subject. At the present stage, the main body of urban community governance mainly includes the community party branch and the community residents' committee, the community owners' committee, the property management company, the community social organization, and the community residents. These elements together constitute the urban community governance system.

The property management company are selected by the owners and the owner signs a contract to provide property management services. The community social organization will be initiated by the community residents to serve the people, public charity, neighborhood assistance, sports and entertainment activities.

In terms of action, the community party branch and the neighborhood committee have the right to guide, supervise, and suggest to the owners' committee and the property management company. The owners' committee and the property management company are responsible for the two committees of the community. The owners' committee and the property management company sign a commercial service purchase contract to supervise the work of the property management company and are responsible to all the owners. The owners' congress of community assembly has the right to dismiss and replace the property management company. All kinds of voluntary organizations and geographical, interest, and industrial groups in the community are spontaneously established by the residents, which are then submitted to the community neighborhood committee for filing. The property management company charges the owner a property fee and provides property services, and will accept the supervision of the owner. The Community Party branches and neighborhood committees provide services to community residents and accept the supervision of the community residents. The community party branches and neighborhood committees shall receive the guidance, support, and help from superior governments.

3. Core stakeholder definition of the three types of micro-renewal

3.1. Core stakeholders of environmental health community micro-renewal

According to the above analysis, the environmental health community micro-renewal mainly depends on the internal strength of the community, involving stakeholders including the owners' committee, community elite, ordinary residents, the property management company, the sub-district office, residents' committees. Because the owners' committee, community elite, ordinary residents are on behalf of the residents, this article will come down the owners' committee, community elites, ordinary residents to the resident groups, the game between them belongs to the game between the resident group. According to the above analysis, the stakeholders of environmental health community micro-renewal are resident groups, the property management company and grass-roots government.

In the environmental health community micro-renewal project, the "bottom-up" micro-renewal mode is mainly initiated by the resident groups to make an appeal to the grassroots government, and the grassroots government and the property management company will provide support. In the process of project development, the resident groups will lead the project scheme design phase. The basic government and the property management company will participate in the scheme design phase, the project implementation phase, and the operation management phase as the auxiliary force. Regardless of the government or the residents being the leader of the micro-renewal process, the property management company will still provide some financial support and aid the operation and maintenance after the completion of the project. The property management company will not play a leading role in the community micro-renewal project, and many old communities that have been built for a long time have no property management companies. Therefore, the property management company is defined as general stakeholders. The process of all stakeholders participating in the "bottom-up" update mode of environmental health community micro-renewal is shown in **Figure 1.**

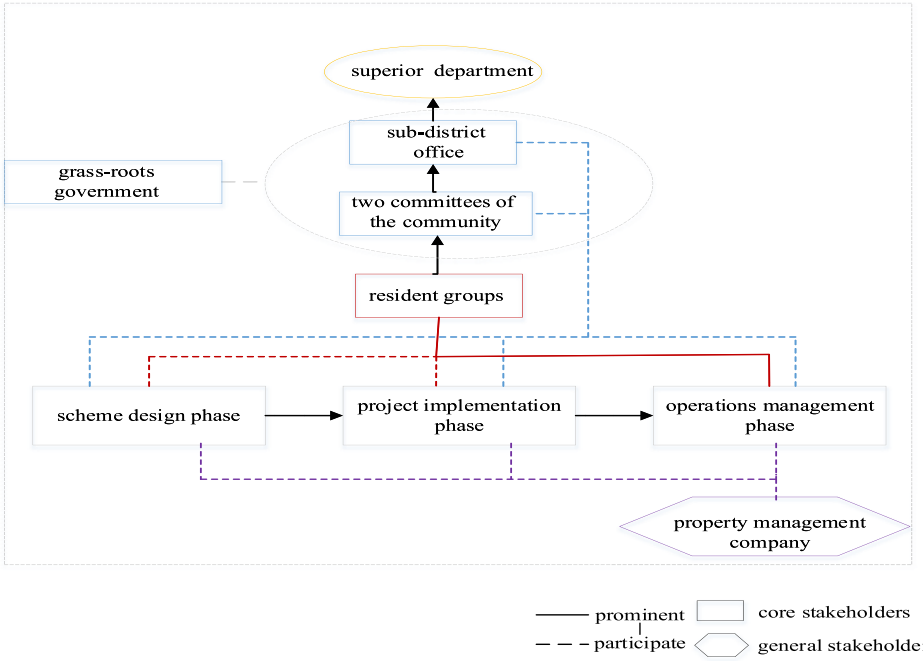

Figure 1. The "bottom-up" update process of the environmental health community micro-renewal

3.2. Core stakeholders of the infrastructure community micro-renewal

The infrastructure community micro-renewal include community education, community endowment, community health care, postal delivery, communication network, public transportation, cable TV, power supply, water supply, community 24 hours convenient business point, community intelligent express ark, stereo parking garage, intelligent charging pile, etc. The participation of external forces such as enterprises would be needed in community micro-renewal, and the stakeholders involved in the infrastructure community micro-renewal include enterprises, the owners' community, community elites, ordinary residents, the sub-district office, designers, residents' committee, and co-construction units. In this mode, the designers and the co-construction unit as the traditional construction projects belong to the same purchased consulting services, participate in the design or construction phase of the project and do not play a leading role in the project. Therefore, the designers and the co-construction unit are defined as marginal stakeholders. Therefore, the core stakeholders of infrastructure community micro-renewal are residents, enterprises and grassroots governments.

For the resident groups with limited resources and abilities or are less participative, the superior government departments will pass the update planning to the grassroots government, the sub-district office, two committees of community, and so on. The grassroots government will lead the community micro-renewal. In the early stages, community research will be done by the grassroots government, opinions from residents will be solicited enterprises will be contacted to participate in the community micro-renewal. The process of all stakeholders participating in the "top-down" update mode of infrastructure community micro-renewal is shown in **Figure 2.**

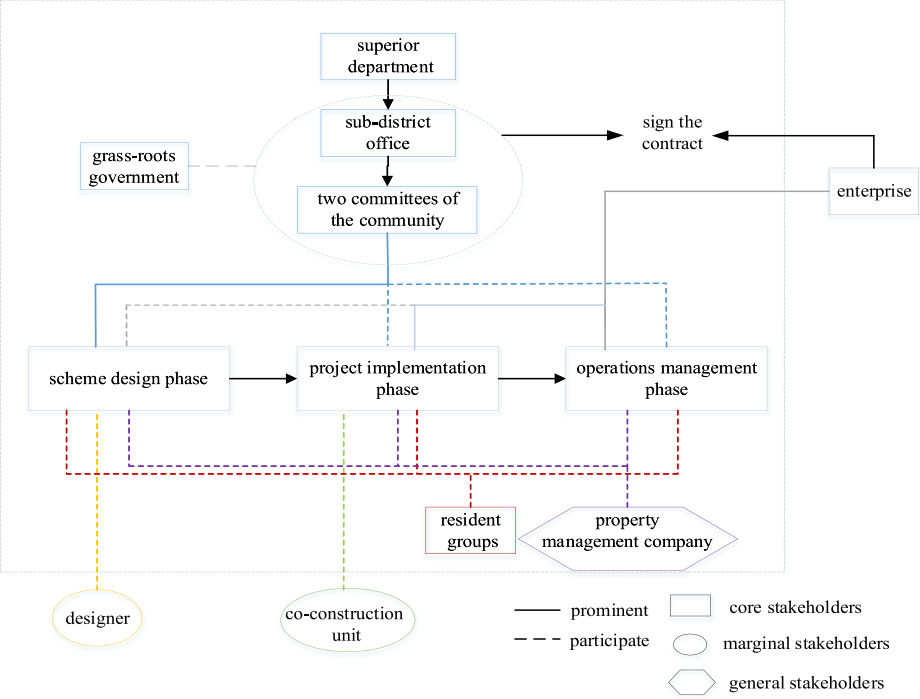

Figure 2. The "top-down" update process of the infrastructure community micro-renewal

For communities where residents are highly participative and are agreeable, community micro-renewal is generally initiated "from the bottom up" by residents, where residents reach consensus on renewal and transformation for community issues and spontaneously sign project contracts with enterprises, and the project funds come from residents raised by themselves or community maintenance funds. This is where all stakeholders participate in the "bottom-up" infrastructure community micro-renewal.

3.3. Core stakeholders of the space construction community micro-renewal

The space construction community micro-renewal project is mainly led by experts, scholars, designers, and other professionals. Experts will investigate community problems and residents' requirements in the early stage of micro-renewal, design a scheme, guide the co-construction unit in the project implementation phase, and conduct skills training for residents after the end of the project. According to previous research, this paper defines the experts, scholars, and designers who lead the community micro-renewal projects as community planners. Therefore, the core stakeholders who are involved in space construction community micro-renewal project include experts, the owners' community, community elites, ordinary residents, the sub-district office, residents' committee, designers, and the co-construction unit. Like the previous definition, the core stakeholders of the space construction community micro-renewal include residents, experts, grass-roots government and the co-construction unit. Such projects are mainly jointly built by experts and residents. When the intervention of professional construction units are needed, it will be similar to the general contracting mode in the traditional construction projects. The co-construction unit are entrusted by the experts. In the process of community space construction, the co-construction unit play no leading role in the project. Therefore, this paper considers the co-construction unit in the space construction projects as marginal stakeholders. Based on this, the core stakeholders of space construction community are residents, grass-roots government and experts.

The space construction community micro-renewal also includes "top-down" micro-renewal mode and "bottom-up" micro-renewal mode. In the "top-down" mode, the government contacts experts and signs service contracts with them, and the government undertakes the main construction funds and later recovers

the funds from the residents. The process of each stakeholder participating in the space construction community micro-renewal is shown in **Figure 3**.

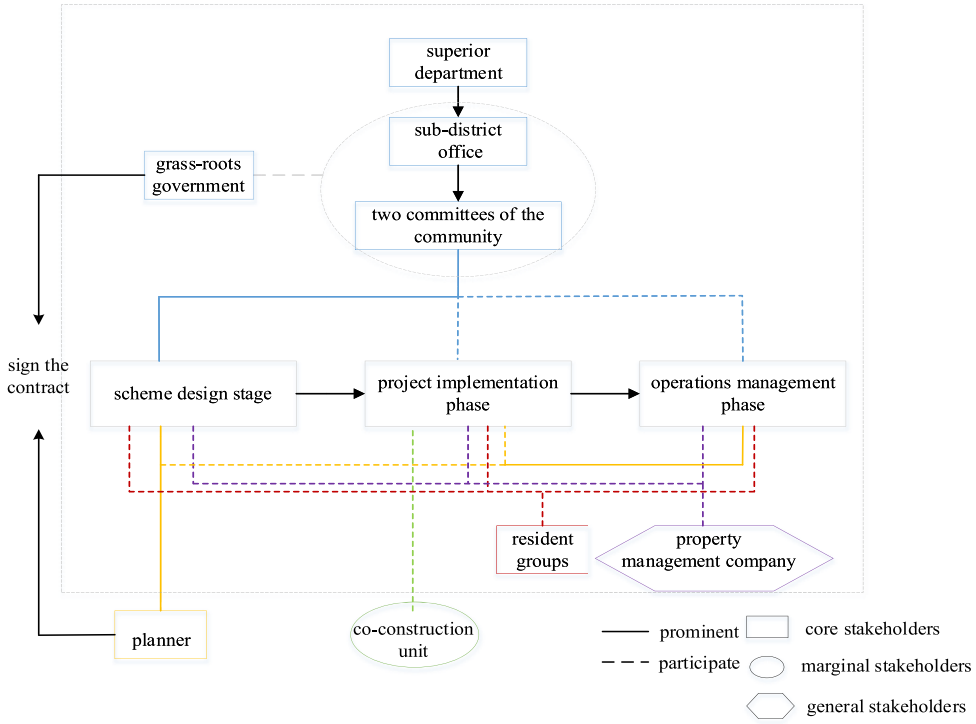

Figure 3. The "top-down" update process of the space construction community micro-renewal

The "bottom-up" mode is that residents independently contact experts and sign service contracts with them, and residents spontaneously raise construction funds and seek the support of the grassroots government. This means that all stakeholders participate in the space construction micro-renewal.

4. Conclusion

To sum up, environmental improvement, infrastructure construction, and space creation are the main contents of community micro-renewal, and each renewal content has corresponding core stakeholders. The core stakeholders of environmental improvement are the grassroots government and residents, and the core stakeholders of infrastructure construction are the grassroots government, the enterprise and residents, and the core stakeholders of the space creation are the grassroots government, experts, and residents.

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Author contributions

Dong Wang designed the research framework and methodology. Xuqing Dong. was responsible for the literature analysis and stakeholders research

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The Doubly Discriminated in the Land of the Free: Exclusion and Empowerment of Queer People of Color from the 1960s to Modern America

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Abstract: This paper explores the double ostracization queer Black, Indigenous, and People of Color (BIPOC) endured in history, as an intersectional result of racist exclusion in the predominantly white narrative of the gay liberation movement and homophobia within oppressed racial groups. It describes how this double discrimination led to disproportionate impacts on the community in the AIDS epidemic from 1980s to 1990s. In the process, the paper restores the erased narratives of queer activists of color, showing how this community united to resist the double discrimination and to speak up through literature and alliances that ultimately overcame some of the societal barriers. Looking forward, the paper argues that a similar pattern is emerging in contemporary America with a disproportionate impact on queer and BIPOC people through the overturn of Roe v. Wade. Drawing on these insights, the paper concludes with the progress the American society has made toward equity for all.

Keywords: Discrimination; Exclusion and empowerment; Progress

Online publication: October 27, 2022

1. Introduction

As Phil Wilson, Founder of Black Gay and Lesbian Leadership Forum (BGLLF) said "When the world beats you up for being Black, then you could turn to your family for emotional strength; but when the world beats you up for being black and gay, you have no place to turn" [1]. From the 1960s to the 1990s, various societal advancements propelled progress toward a more equitable America. Before the 1960s, anti-immigration and anti-Vietnam war sentiments as well as prevalent racism strengthened marginalization against Asian Americans, Latinos and they were often considered "invisible" in national politics, and the Black community endured "a time of danger and turmoil" as Jim Crow Laws and segregation plagued America while queer people of all backgrounds suffered in silence as they were afraid to come out of the closet due to potential backlash [2,3].

However, from the 1960s to the 1990s, through the Asian American movement, the Chicano Rights Movement, the Black Civil Rights movement, and the gay liberation movement, voices from various oppressed minority groups shattered their silence and fought against centuries-old injustices [4]. Despite this rise in visibility of minority groups, those who identified as queer and as people of color were often neglected by both worlds due to the racism permeating the LGBTQ+ community and the widespread homophobia in communities of color. This paper aims to underscore how the predominantly white narrative in the LGBTQ+ community deterred people of color from the mainstream queer rights movement as well

as the disproportionate impacts that AIDS epidemic in the 1980s and the overturn of Roe v. Wade had on marginalized queer BIPOC, ultimately preventing America from becoming the "land of the free."

2. The double ostracization queer BIPOC in early America

Personal stories from the 1970s to the 1990s reflect this prevalent discrimination and marginalization in queer communities of color, and the intolerance of homosexuality was especially prevalent in churches or other religious spaces — places often considered the core of many minority communities in America [4]. For example, having been told "if he did not mend his ways, he would go to hell" by his Christian minister and that he was his parents' "disgrace" after he came out, Black LGBTQ+ minister Carl Bean encountered homophobia from his church throughout his life [5]. Similarly, Muslim leader Louis Farrakhan claimed that "society is on the decline when men start inclining towards other men and women incline towards other women" during a 1989 speech to more than 2,000 followers in California [5]. Cleo Manago, an African American activist, mentioned how he grew up hearing from his church as well as friends and family that "homosexuality" belonged to "only scrawny white boys" [5]. Cheryl Anne Medoza, a Filipina woman who serves as deputy director of Gay and Lesbian Community Services Center in Hollywood, highlights how she never came out to her parents because homosexuality "is just about taboo" in many Asian families and that Asians "are vehemently opposed to any type of activity that shatters the model minority myth" [5]. Her silence was a product of not solely homophobia within the Asian community but also racism within the greater American society. Countless other LGBTQ+ people of color like Medoza encounter the dual effects of their sexuality and race daily. Ultimately, the racism among the LGBTQ+ community hindered not only queer BIPOC from finding their true selves within the queer community but also the progress of the LGBTQ+ movement as queer people of color were seldomly empowered by it.

Neglected by mainstream movements for LGBTQ+ rights and for equity for people of color, queer BIPOC became doubly discriminated against and ignored during the AIDS epidemic from the early 1980s to the late 1990s. Starting in San Francisco, California, with the first American patient Ken Horne, the AIDS epidemic quickly spread through American society while targeting LGBTQ+ communities [6]. Viewed as more accepting for white homosexual couples than for queer BIPOC, countless voices from LGBTQ+ people of color became neglected while many "distort[ed] the realities and struggles of those who have died" [1]. As 1989 federal statistics highlighted, "43% of all people with AIDS are members of minority groups, and more than 70% of them acquired the disease through homosexual or bisexual affairs" [5]. The disproportionate impact AIDS had on society was evident as Black Americans made up of 25% of AIDS patients as a whole, with half of all women and children suffering from AIDS being Black [5]. This was a product of the silencing forced upon the queer community as many societal barriers prevented LGBTQ+ people, specifically queer people of color, from speaking out and receiving help. Framed as "a white gay disease," many queer people of color became silenced and uneducated on AIDS as they did not think the crisis applied to them [7]. Lydia Otero, a 32-year-old queer Latina who leads Gay and Lesbian Latinos Unidos, noted that "it was very hard for [latiné queer people] to get AIDS information or pamphlets on gay services translated into Spanish because it was not considered important enough" [5]. The language barrier as well as the lack of support for queer BIPOC silenced countless LGBTQ+ people of color while the racist, the homophobic society made it difficult for them to become informed and avoid AIDS. Moreover, due to the lack of visibility that plagued queer people of color, the American society as a whole often ignored the intersectionality between race and sexuality as well as gender identity. With the rise in AIDS, however, "people who wanted to think there was no such thing as a gay black man or a gay Latino had a rude awakening," said Carl Bean, a Black queer archbishop who founded the Minority AIDS Project in South-Central Los Angeles in 1985 [5].

The racism plaguing predominantly white LGBTQ+ establishments and the homophobia prevalent

among prominent civil rights groups as well as traditional systems also led to the disproportionate effects on queer communities of color during the AIDS epidemic. For example, Steve Schulte, one of West Hollywood City Council's two white gay Councilman, said that "minority issues are rarely discussed by the Council" and highlighted that the Council "denied grants to the Minority AIDS Project while it helps finance other mainstream AIDS groups, including AIDS project Los Angeles," an organization with a board that consisted predominantly of white, gay men [8,5]. The discrimination of queer BIPOC from organizations that support racial equality was also prevalent. For example, the National Association for the Advancement of Colored People (NAACP) was a civil rights organization that played a pivotal role in the Black civil rights movement as it aimed to abolish segregation, discrimination, and racial violence [9]. However, their activism did not extend to the queer Black community: Althea Simmons, NAACP's chief lobbyist, mentioned in an interview that NAACP has "no position on homosexuality, period" [5]. Furthermore, the widespread racism within the healthcare industry in the 1980s further discriminated against queer people of color as companies such as Empire Blue Cross resisted claims surrounding AIDS and prevented queer people, especially LGBTQ+ BIPOC, from receiving the funds they need to restricting insurance money. Since many people of color were systematically prevented from receiving higher education through practices such as segregation, these communities could not fight against the healthcare system like their white counterparts often could and suffered in silence. Ultimately, the lack of support for queer people of color made it more difficult for them to educate themselves during the AIDS epidemic, sparking mistreatment from homophobic civil rights groups and racist LGBTQ+ affinity organizations as well as other societal establishments on a daily basis and becoming doubly disadvantaged.

However, marginalized queer minorities did not succumb to societal pressures from the LGBTQ+ community or the greater American society; instead, they empowered each other in their fight against injustices through performing arts and literature, the creation of affinity spaces, as well as various conferences with the theme of fostering inclusion for LGBTQ+ BIPOC communities. From the 1970s to the 1990s, arts and literature from marginalized minority queer people flourished as newspapers, performance groups, and writing generated awareness among the queer community and others. For example, in this time period, newspapers such as BLK targeting Black queer voices and Unidad, which was centered around Hispanic LGBTQ+ voices, were distributed throughout predominantly-Black and predominantly-Hispanic communities, respectively, in Los Angeles to raise awareness and urge queer BIPOC to come out of the closet [10]. In 1979, a feminist Asian women's performance group called Unbound Feet consisting of Asian lesbians such as Kitty Tsui and Merle Woo strengthened visibility for queer people of color as they gained success despite the program explicitly stating their sexuality [11]. Outside of the group, Tsui and Woo highlighted the exclusion they faced from family through writing. As the first Chinese-American lesbian to ever publish a poetry collection, Tsui's 1983 poem *A Chinese Banquet* underscores her struggles with queerness as she wants to "tell her: 'mother, I'm gay…but she will not listen'" and "it is not what she wants to hear" [12]. Merle Woo's 1980 letter to her mother also emphasizes her struggles as Woo's mother mentioned that she supports Woo "in everything [she does] except…speaking out" about her sexuality [13]. Black/Out, a magazine of the National Coalition of Black Lesbians and Gays, highlights that the "[Gay rights movement] has failed to embrace us" and "the Black civil rights movement seems slow to add gender and sexual politics to its agenda" [14]. From struggles in expressing their true selves to their families to societal obstacles, literature within queer communities of color helped these activists shed light on their voices and fight against the predominantly white narrative.

Similarly, from the 1960s to the 1990s, diverse activists around the United States also shed light on the exclusion of BIPOC in supposedly accepting queer spaces and brought marginalized communities together through creating affinity spaces as well as alliances. "[The LGBTQ+ movement] has spread to black neighborhoods in South-Central [Los Angeles], Latino neighborhoods in East L.A. and Asian areas

like Chinatown," said Deborah Johnson, a Black lesbian activist [5]. Between 1975 and 1983, Chicana lesbian Diane Felix led the Gay Latino Alliance (GALA) in San Francisco Bay Area, providing support for hundreds of queer Latiné people who "encountered racism and discrimination in predominantly white spaces…and aspired to organize politically" while wanting to bond with those from similar backgrounds [15]. After sensing that gay bars "catered to a white clientele" and "no one wanted to meet people like [him]...they wanted to meet blondes with blue eyes," Tai Yamamoto, a Japanese American gay man, organized a social group for gay Asian American and Pacific Islanders, gaining around 200 members that met to discuss their gender identities and sexual orientation while exploring the intersectionality between their culture and their LGBTQ+ identity in this unique, accepting space [5]. Similarly, groups such as the Latino Lesbian and Gay Organization (LLEGO, meaning "arrived" in Spanish) in Washington and the National Black Gay and Lesbian Leadership Forum in Los Angeles empowered minority groups to lean on one another against both homophobia and racism. "Groups like these," said Black lesbian activist Deborah Johnson, "allows us to be both Black and lesbian or gay, without having to choose between the two in our activism" [5].

3. The current situation of queer BIPOC

Though many queer BIPOC have broken the centuries-long silence enforced upon them, they are still doubly discriminated by those of the same racial community and the LGBTQ+ community in contemporary America. A 2020 survey highlights that queer people of color "face higher rates of mistreatment in employment, the criminal justice system, and their personal lives than their white LGBTQ counterparts," with 24% of queer BIPOC reporting discriminatory treatment from a health care provider while 17% of white respondents reported the same [16]. Furthermore, in 2017, the AIDS epidemic continues to haunt queer BIPOC as the disease was considered as a white gay disease and many queer communities of color failed to recognize its true impacts [17]. And this pattern repeats itself through the overturn of the landmark 1973 Roe v. Wade Supreme Court of the United States (SCOTUS) decision, women across the United States obtained their right to receive abortions, or a practice in which a doctor terminates a pregnancy, without excessive governmental restrictions. On December 1st, 2021, SCOTUS heard oral arguments in Dobbs v. Jackson Women's Health Organization, which questioned the constitutionality of Mississippi's 15-week abortion ban; and on June 24th, 2022, SCOTUS in a 5-4 decision overturned Roe v. Wade, thus giving state governments more freedom in executing limitations surrounding abortion and disproportionately impacts communities of color as well as queer communities [18,19].

Even before Roe v. Wade was overturned, many people already faced countless barriers in obtaining abortion care, from discriminatory insurance coverage bans such as the Hyde Amendment, which prohibits federal funding for abortion, to forced waiting periods during which women must receive counseling prior to abortion. Furthermore, transgender and nonbinary people often have fewer resources and often face stigma in the healthcare system, worsened by the transphobic laws within the states as well as restriction on gender-affirming healthcare [4]. In addition, abortion providers could be scarce — six states have only one abortion provider while Oklahoma has no abortion clinics — or unaffordable, leaving those with fewer resources behind as they are forced to give birth.

When Roe v. Wade was overturned, these gaps widened. 26 states were certain or likely to move quickly to ban abortion while 13 among the 26 have "trigger laws" that are designed to take effect automatically: Arkansas, Idaho, Kentucky, Louisiana, Mississippi, North Dakota, Missouri, Oklahoma, South Dakota, Tennessee, Texas, Utah, and Wyoming. Some states also have multiple bans; for example, 9 states have pre-Roe bans, 11 states have early gestational age bans, and some states even prohibit abortion under all or nearly all circumstances, "a tactic widely viewed as an attempt to provide a legal challenge to [Roe v. Wade]." In these cases, the state officials will determine which ban to enforce when Roe is

overturned. On the opposite side of the spectrum, 16 states had laws that "protect the right to have an abortion up until the fetus can live independently outside the womb" [18]. For example, the General Assembly in Connecticut approved the "safe harbor law" that went into effect on July 1st, 2022, clarifying in statute who may perform abortions in the first trimester and protecting abortion seekers from other states as well as abortion providers [18].

However, the idea that one must cross state borders for abortion conflicts with the American founding ideal of "freedom for all" as the freedom to get abortions are only for those in certain states and those who have the financial capability to travel to other states. Furthermore, many of the states with the harshest laws against abortion are clustered in the Midwest, the South, and the Plains, so the difficulty in accessing abortion varies by geographic region as well since it's likely that a woman in Louisiana will have a more challenging time than a woman living on the border between Utah and Colorado.

4. Conclusion

The overturn widens the social and financial gap within American society, especially targeting marginalized groups such as communities of color, queer communities, differently-abled people, and low-income communities in states that have trigger laws and beyond. Approximately 75% of abortion patients have low income, Black patients accounting for 28% of all abortion patients, while Hispanic patients accounting for 25%, and White patients accounting for 39% in 2014 [19]. This means that the majority of abortion patients are people of color who already face constant discrimination, and this gap already mirrors the racial disparities among patients during the AIDS epidemic.

Although sexual and racial minorities rose to visibility with various social movements from 1960s to 1990s, the predominantly white narrative in the queer community neglected queer BIPOC, resulting in disproportionate impacts on the group during both the 1980s AIDS epidemic and overturn of Roe v. Wade in 2022. Ultimately, the impacts of the exclusion of LBGTQ+ BIPOC from the LGBTQ+ movement still plague modern American society, hindering progress toward gender equity as well as financial and racial equity in American society. However, similar to how queer communities of color bonded and rose above societal barriers when they faced the AIDS epidemic of 1980, protests have sparked across the nation against the overturn of Roe v. Wade. With enough people in the movement against racism, sexism, and homophobia, as well as more awareness and recognition of oppressed narratives, America will become a true land of the free for all and achieve equity in the healthcare system and beyond.

Disclosure statement

The author declares no conflict of interest.

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Failing at Face Value: The Effect of Biased Facial Recognition Technology on Racial Discrimination in Criminal Justice

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Abstract: Recent years have seen a rise in the development of technological innovations and their implementation in various industries. Specifically, law enforcement agencies across the United States have partnered with technology companies to deploy facial recognition algorithms in the identification and prosecution of criminal suspects. Yet there is concern that law enforcement's use of facial recognition algorithms based on biased mugshot data pools can lead to criminalizing innocent civilians. Prominent theories including intersection theory, instrumentalization theory, and Alvarado's theory were analyzed to review arguments that justify concern. We find that intersection theory is supported by empirical evidence that women of color are put at the greatest disadvantage from technological bias; instrumentalization theory is supported by examples of both positive and negative implementations of facial recognition technology, and Alvarado's theory further suggests the possible reinforcement of existing biases by these poor applications of technology.

Keywords: Racial discrimination; Facial recognition technology

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1. Introduction

Immigration and globalization increased ethnic diversity globally in recent decades, prompting questions about the equal application of justice to populations consisting of people from contrasting backgrounds and cultures. Conceptually, racism has played a role in the US justice system. In practice, the country's criminal justice system has been criticized for taking away the rights of individuals based on racial or socioeconomic divides. In the digital century, the introduction of technology into policing and criminal justice adds a potential layer of discrimination in law enforcement and governance. Facial recognition use has steadily increased, and it is predicted to double by 2027 (see **Figure 1** in the **Appendix**). Technological innovations are helpful overall, but they can also misconstrue the images and realities of low-income Americans and people of color. Various theories including Alvarado's theory of ethnicity & racial stereotypes, intersection theory, and instrumentalization theory/critical theory of technology can shed critical light on the modern implementations of facial recognition technology in law enforcement.

2. Types of facial recognition technology

2.1. Feature analysis

From a neurological standpoint, humans recognize other people based on the spatial arrangement of facial features including the eyes, nose, mouth, and chin. This method of facial recognition relies on "the

extraction and measurement of facial features" [1]. Facial recognition algorithms determine the relation of these features via mathematical analysis of angles, distances, and areas of each feature in relation to each other. The eyes are considered the most obvious facial feature with the highest accuracy. Thus, most often, the algorithms first focus on finding the location of the two irises to map out the rest of the facial features.

Neural Network

Simulating the way neurons in human brains send signals, facial recognition software train neural networks with vast amounts of data to improve accuracy and efficiency in identification. By analyzing training examples from the photo database, neural networks are then used to identify the face in a new photo that was not part of the original training dataset [2]. For example, a neural network can be trained on a dataset consisting of thousands of pre-labeled images of each individual. The system would "find visual patterns in the images that consistently correlate with particular labels" [3]. After the training process, these networks are able to identify a person in a photo that the neural network has never seen before (see **Figure 2** in the **Appendix**).

2.2. Holistic Matching

Rather than extracting features, the holistic face recognition method uses the whole face in the image, creating a vector composed of the gray values of all pixels in the face [4]. For example, the skin texture analysis method uses algorithms to measure lines, pores, and skin texture, developing facial models unique to each individual [5].

Eigen Faces

Features on the face (e.g. eyes, nose, and mouth) are pieced together to form an eigenface (see **Figure 3** in the **Appendix**). Once the eigenface is formed for the person in the photo, it is compared to previously created eigenfaces for that same person. The eigenfaces are projected on top of each other, and the distances between the two are calculated. If the distance is within a certain margin, it is concluded that the two images resemble the same person. Similarly, eigenfaces can be used in the case that the "eigenface with the smallest Euclidian distance is the one the person resembles the most" [6].

2.3. Hybrid

A combination of Holistic Matching and Feature Analysis, the hybrid method utilizes both recognition processes (see **Figure 4** in the **Appendix**). Features are extracted and analyzed. "The outputs from the individual components are then combined to give the final recognition output" [7].

3. Benefits of facial recognition technology

Globally, the implementation of advanced facial recognition systems has had positive effects in many cases across various industries.

3.1. Healthcare

Facial recognition has been tested in hospitals to streamline patient check-in, lessening the burden on hospital staff while also reducing human clerical errors. A hospital's facial recognition system can verify a patient's identity and insurance information to reduce wait time and serve as a security measure by monitoring individuals who enter and leave the hospital. Facial recognition algorithms have been proven successful in diagnosing rare genetic disorders based on identifying slight changes to facial characteristics, then using that information to generate a list of potential diagnoses along with their percent likelihood. For example, Face2Gene (an app that utilizes facial recognition to help doctors make medical diagnoses) has

been used on 250,000 patients and helped in identifying over 7,000 conditions [8].

3.2. Security and fraud

Airports across the United States currently utilize facial recognition technology to match passport photos with a database to verify the identity of travelers. In three specific examples, travelers have used fraudulent passports to enter the United States from Brazil, Ghana, and Cameroon. In all of these cases, facial recognition technology alerted U.S. Customs and Border Protection agents that the passport photos did not match the claimed identity. As of June 2020, nearly 300 individuals have been intercepted attempting to enter the U.S. under a fraudulent identity [9]. The U.S. Department of Homeland Security expects this technology to be used on 97% of travelers by 2023.

Banks have begun testing solutions that would have customers scan their faces to access ATM services to reduce the likelihood of fraud and hacking associated with the current PIN system [8].

3.3. Crime

Within 24 hours after holding a woman at knifepoint, police apprehended and arrested the rapist using facial recognition technology [10]. In another example, the New York City Police Department used facial recognition algorithms on security footage to identify a suspected subway terrorist. Within minutes, the system reported hundreds of potential matches. The detectives then sorted through the matches and identified the suspect by the end of the hour. Without facial recognition technology, it would have taken many hours or days to manually sort through videos and images based on witness descriptions of the suspect [11].

Spotlight is a tool that utilizes facial recognition algorithms to help find sex trafficking victims in online ads. Reports show that it has been used to help rescue 15,000 children and identify 17,000 traffickers in North America [9].

In Detroit, Michigan, a gunman killed three members of the LGBTQ+ community in a targeted attack. The local police department used facial recognition systems on videos from a gas station to identify and prosecute the suspect.

3.4. Finding missing people

In India, facial recognition systems have helped police find 2,930 missing children in the city [12].

4. Concerns: the evidence

4.1. Flawed mugshot databases used by facial recognition algorithms

Despite all of the aforementioned advantages, inaccurate surveillance technologies or poor use of those technologies by law enforcement can result in inaccurate rulings in court. Black Americans are more likely to be arrested and incarcerated for minor crimes than White Americans. Consequently, Black people are overrepresented in the mugshot data used by face recognition to make predictions. The result of this system is higher rates of false incarceration for people of color. Face recognition technologies across 189 algorithms are least accurate on women of color, with error rates up to 34% higher than for lighter-skinned males [13].

One out of four state and local law enforcement agencies have access to facial recognition technology. Clearview AI is a major startup company that has partnered with over 3,000 law enforcement agencies on all levels, with a photo database significantly larger than government databases (10 billion photos compared to FBI's 640 million photo database). Similar companies include Vigilant Solutions, ODIN Intelligence, Ayonix, Cognitec, and iOmniscient [14]. Most facial recognition software use public images (e.g. mugshot data) to train the algorithms. In fact, Clearview AI specifically worked to acquire all U.S. mugshots from

the past 15 years to build their dataset for training facial recognition models [15]. However, this common way of training facial recognition algorithms is at the core of a biased criminal justice process. Images in the datasets used to train the algorithms are not proportionally representative of the diversity of the United States population. Black Americans are more likely to be arrested for minor crimes compared to White Americans. Thus, Black Americans are overrepresented in mugshot databases used by facial recognition software. This contributes to a cycle where "racist policing strategies lead to disproportionate arrests of Black people, who are then subject to further surveillance" [13].

4.2. Biased policing strategies

In fact, cameras with built-in facial recognition systems were frequently installed in majority-Black areas while rarely installed in predominantly White and Asian neighborhoods. These racially biased surveillance methods contribute to unbalanced mugshot databases, leading to inaccurate facial recognition conclusions. Not only are African Americans more likely to be surveilled, they are also more likely to be stopped by law enforcement and be subjected to facial recognition searches compared to people of other ethnicities [16]. In fact, stop-and-frisk data shows that Black and Latinx people have been pulled over or stopped on the street even if they had done nothing wrong. In 97% of these cases, there is no evidence of any crime, and the individuals are being stopped by law enforcement solely because of skin color [17]. Similarly, another study that analyzed 95 million stops by police found that Black people were more likely to be pulled over than White people, but the disparity decreases at night when it is harder for police to distinguish the race of the driver.

4.3. Challenges with acquiring images/videos to run facial recognition

Oftentimes, law enforcement agencies pull footage from security cameras from public places including stores and gas stations. However, many cameras' default settings are not optimized to capture darker skin tones, resulting in lower-quality database images of Black Americans [13]. Low-quality images add another layer of uncertainty in facial recognition algorithms, displaying higher levels of inaccurate results.

4.4. Algorithm inaccuracies: statistics

The error rate of facial recognition algorithms rose 9.2% when the images were taken in public compared to high-quality images where the subject is not moving. Error rates increased when the subject was not looking at the camera [8].

4.5. Algorithm inaccuracies based on demographics: statistics

While it is usually incorrect to make a statement about all facial recognition software, the vast majority of facial recognition algorithms display demographic biases backed by empirical evidence. The National Institute of Standards and Technology evaluated most of the industry by analyzing 189 algorithms from 99 different developers. The study made a distinction between "one-to-one" matching that "confirms a photo matches a different photo of the same person in a database" and "one-to-many" matching that determines whether an individual in an image matches anyone in the database. It is acknowledged that the software can make false positives (believing that two different individuals are the same person) and false negatives (not matching two photos of the same person). In application, this means that inaccuracy can work in the direction of both false exoneration and false indictment. American Indians had the highest rate of false positives for one-to-one matching, whereas African American females had the highest rate of false positives for one-to-many matching, showing potential for consequences including false accusations [18]. Asian and African American individuals were up to 100 times more likely to be misidentified compared to White males. Women were more likely to be misidentified than men. Middle-aged White males had the highest

accuracy rates across various facial recognition algorithms [19].

Comparing accuracy levels of different facial recognition softwares

A Gender Shades study analyzed algorithms produced by Microsoft, Face++, and IBM to compare rates of demographic bias. All companies performed the worst on darker females. IBM and Microsoft performed better on light-skinned males, whereas Face++ performed best on darker males. In general, all companies performed better on lighter individuals compared to darker individuals with a difference in error rates between 11.8% and 19.2%. IBM's algorithm had a 34.3% higher error rate in identifying darker females compared to lighter males. 95.9% of the faces misgendered by Face++ algorithms were of female subjects [16].

Amazon's algorithms worked successfully on images of light-skinned males, but misidentified the gender of darker-skinned women 30% of the time [19]. Amazon is marketing their Rekognition system to law enforcement. However, this system incorrectly matched 28 photos of members of Congress. While 20% of Congress members are people of color, they constituted 40% of false matches from the system.

With these high error rates, facial recognition entrenches systemic racism by supercharging the government's ability to surveil and target marginalized groups, impacting core rights and taking away necessities. Police and other government agencies use these systems to intimidate activists, target immigrants, wrongfully accuse people of crimes, and impede access to needed public resources such as unemployment relief and housing [20]. This use of inaccurate technology leads to self-censorship among communities of color out of fear of retribution, fueling the widespread issue of drowning out the voices of marginalized populations.

4.6. General incarceration rates statistics

38.4% of the inmate population are black people and 93.1% are males [21]. The FBI's Uniform Crime Reporting Program found that black people were overrepresented among persons arrested for nonfatal violent crimes (33%) and for serious nonfatal violent crimes (36%) relative to their representation in the U.S. population (13%) [22].

4.7. Lack of transparency

One of the greatest concerns regarding facial recognition, besides its demographic biases, is law enforcement's lack of transparency. The Government Accountability Office criticized the U.S. Customs and Border Protection for "lackluster accuracy audits, poor signage notifying the public the technology is being used, and little information offered to the public on how its systems worked" [15]. From the public's perspective, a study found that 71.1% of survey respondents reported that they were "very" or "somewhat" concerned about their privacy in regards to facial recognition on video images [23].

5. Theories

5.1. Alvarado's theory

Inaccurate technology affects public perception of people of color. A subsect of Alvarado's theory of ethnicity postulates that stereotypes displayed throughout the media represent ethnic minorities as "dangerous to society," causing people to blame them for social issues. News outlets often group individuals together based on their race, or under the title of "immigrants", perpetuating xenophobia. This lack of personalization makes it easier to blame them [ethnic groups] for a range of social problems [24].

5.2. Intersection theory

Intersection theory, developed in 1989 by Kimberlé Crenshaw, asserts that because racial biases are shaped by other factors (including gender), these attributes must be examined together. The theory claims that racial prejudice can be dissected into many layers of disadvantage. The theory states that: "For example, if we want to understand prejudice, we must understand that the prejudice focused on a white woman because of her gender is very different from the layered prejudice focused on a poor Asian woman, who is affected by stereotypes related to being poor, being a woman, and her ethnic status" [25].

5.3. Instrumentalization theory

Instrumentalization theory (critical theory of technology), proposes that "technology must be analyzed at two levels: one is the level of our original functional relation to reality and the second is the level of design and implementation" [26]. The first level analyzes the technology strictly based on useful properties. The second level contextualizes these properties in relation to existing technologies and societal uses. In the early stages of facial recognition technology (1964), researchers wanted to answer the basic question of whether programming computers are capable of recognizing human faces. In the early 2000s, facial recognition vendor tests began as government agencies evaluated this relatively new technology that was now commercially available.

6. Analyzing theories: evidence

6.1. Alvarado's theory

Society quite commonly conflates social problems like crime or violence or disease with black and brown people [26]. Oftentimes as a result of the media spreading information about prosecutions that may result from inaccurate technology, people of color are seen as more violent/dangerous in communities. For example, in a study, each of 950+ participants was shown a series of color photographs of white and black male faces of individuals who were all of equal height and weight. Results showed that participants judged the black men to be larger, stronger and more muscular than the white men, even though they were actually the same size. Participants also believed that the black men were more capable of causing harm in a hypothetical altercation and, troublingly, that police would be more justified in using force to subdue them, even if the men were unarmed [27]. On the flip side, individuals who understand the shortfalls of technology misused can be turned away from using technology in the justice system altogether or be disincentivized to use technological innovations out of fear of perpetuating current problems. This raises the dilemma of finding a balance between our growing reliance on technological innovations and ensuring that these services benefit all members of society equally.

6.2. Intersection theory

Examining the validity of intersection theory from the lens of facial recognition in criminal justice, it is evident that race and gender can in fact be layered to result in higher levels of discrimination. Besides, researchers found that facial recognition technology falsely identified Black and Asian faces 10 to 100 times more often than they did white faces. The technologies also falsely identified women more than they did men - making Black women particularly vulnerable to algorithmic bias [28].

6.3. Instrumentalization theory

Facial recognition is not supposed to be used on its own to establish probable cause for an arrest [29]. Yet research shows that many law enforcement agencies have relied almost exclusively on facial recognition systems to make an arrest. In fact, the NYPD noted that it has turned to facial recognition in more than 22,000 cases in the last three years [30]. When misused, these technological innovations end up harming

innocent civilians and exposing vulnerable populations to inapt surveillance systems, while at the same time building mistrust of the justice system among minority populations. This problem is exacerbated by the fact that facial recognition software varies across law enforcement agencies, and many agencies have lower standards of accuracy than the FBI or do not conduct accuracy tests at all. Studies have attempted to quantify exactly how many arrests/convictions have resulted from inaccurate uses of facial recognition. If we assume that misidentifications happened in only one out of a thousand searches, or .1% or the time, this would mean that, in Florida alone, eight people are implicated in a crime they did not commit each month [31].

7. Appeals process

Defendants have the constitutional right to "probe" the accuracy of the facial recognition systems used to accuse them before being convicted [32]. The Supreme Court ruled in Brady v. Maryland that prosecutors must provide defendants and jurors access to "potentially exculpatory evidence," which would include information regarding the workings and results of facial recognition algorithms [33].

However, few defense attorneys actually challenge the accuracy of the system, and not all courts agree that defendants have this right. A Florida appellate court ruled in 2019 that a convicted individual did not have the right to view the results of the facial recognition test that led to his arrest, even though the algorithm only had a one-star confidence level (extremely low) for producing the correct match.

8. Conclusion

Law enforcement agencies on the local, state, and federal level have partnered with tech companies to deploy facial recognition technology in their local communities. The technologies use different techniques, including "feature analysis," "holistic matching," and 'hybrid methods." To various degrees, all these approaches, when used in law enforcement, can reinforce racial stereotypes across the country. This is because the databases used to train these facial recognition software are biased in their over-representation of minorities. This results in inaccurate rulings in court and wrongful arrests, perpetuating existing racial stereotypes. Theories of intersectionality suggest that women of color are especially vulnerable. Instrumentalization theory proposes that the intrinsic effects and the technological capabilities of facial recognition must be separated from the biases induced by the specific ways in which these technologies are used by the government. Finally, Alvarado's theory of ethnicity shows the impact of biased technology on skewing incarceration demographics, with secondary implications on public perception and stereotyping of minorities. Facial recognition and other technologies used in criminal justice can result in biases against people of color and perpetuate racist ideologies. As society becomes more technologically advanced, it is increasingly important to monitor and ensure the accurate uses of these technologies, to avoid introducing new societal divides along racial lines.

Disclosure statement

The author declares no conflict of interest.

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Appendix

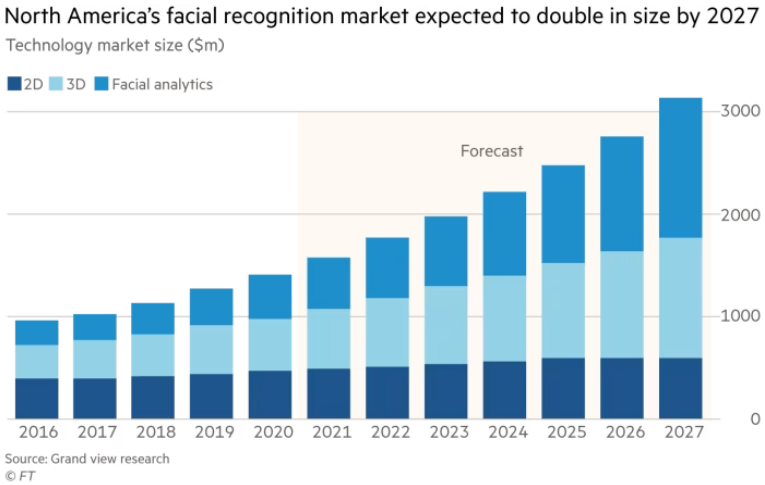

Figure 1. Growing use of facial recognition [34]

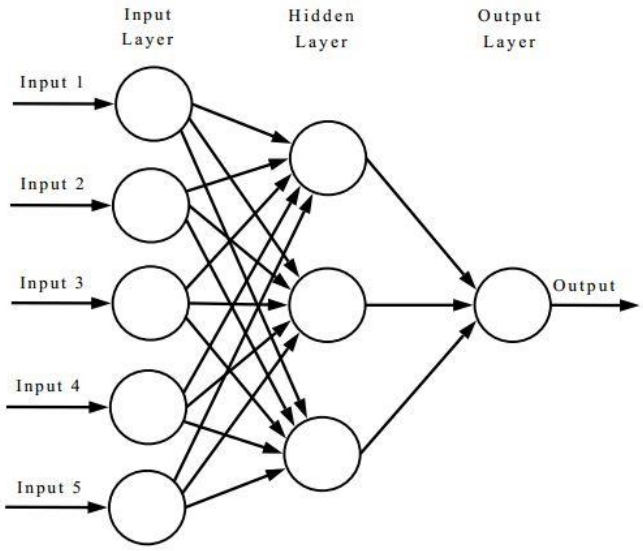

Figure 2. Diagram of Artificial Neural Networks [35]

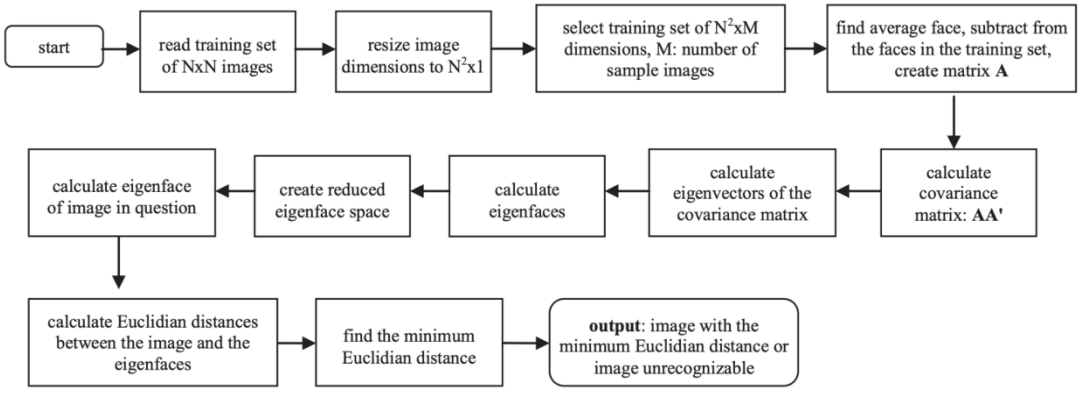

Figure 3. Flowchart of the algorithm of the Eigenfaces Method [6]

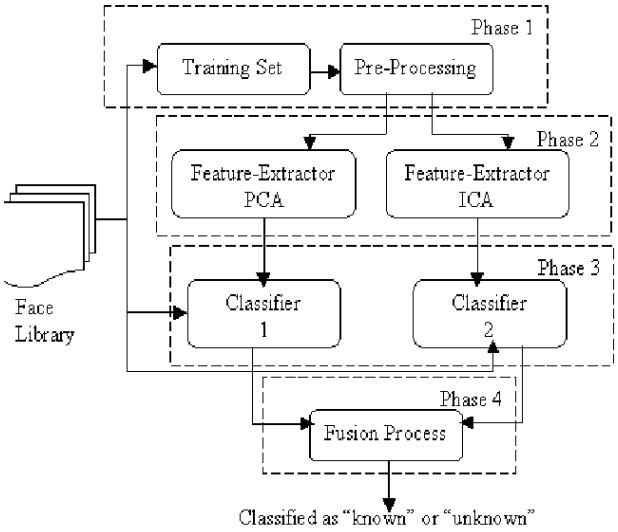

Figure 4. Hybrid Facial Recognition [36]

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Research on the Promotion of Corporate Culture of Qingdao Rongchuang Technology Co., Ltd.

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Abstract: Culture is the soul of an organization and the soft power of enterprise development and competition. The competition of contemporary enterprises is not only the competition of technology, knowledge and talents, but also the competition among enterprise cultures. An excellent corporate culture can not only create a good organizational atmosphere, attract and unite employees who conform to the beliefs of the organization, but also effectively motivate and restrain employees, promote the common growth of employees and the organization, and improve the performance of the organization. Qingdao Rongchuang Technology Co., Ltd. was founded in the early 20th century. After 20 years of development, it has formed a relatively systematic cultural concept system and accumulated certain experience in cultural construction. This paper comprehensively considers the company's growth history, management status and future development strategy, and refers to Danielson's organizational culture model and opposing values model. The company's corporate culture was systematically scanned and diagnosed by using the organizational culture evaluation tool OCAI and other related tools.

Keywords: Corporate culture; Internet enterprises; Measurement of the culture; OCAI

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1. Introduction

Corporate culture is the decisive factor of the success or failure of an enterprise, and also the internal guarantee for an enterprise to improve its core competitiveness. An important part of Internet enterprises is knowledge-based talents. Therefore, enterprise culture is the key for Internet enterprises to cultivate learning organization, stimulate employees' creativity and improve their performance. Based on the theory of corporate culture, this paper takes Qingdao Rongchuang Technology Co., Ltd. as the research object and puts forward the measures to improve the corporate culture construction of the company through the analysis of the corporate culture construction of the company [1].

This paper investigates the degree of corporate culture identity of employees through questionnaire survey and interview, and concludes the necessity of promoting the corporate culture construction of Qingdao Rongchuang Technology Co., Ltd. Based on the results of questionnaire surveys and interviews, OCAI (organizational culture assessment tool) and other relevant tools are investigated. Through the scanning and diagnosis of corporate culture system, the present situation and future countermeasures of corporate culture construction of the company are discussed [2].

1.1. The statement of the research problem

This research aims to determine how corporate culture is promoted in Qingdao Rongchuang Technology Co., Ltd. Specifically, it addresses the following problems:

(1) Enterprises have insufficient understanding of corporate culture construction.
(2) Corporate culture construction is not innovative and informal.
(3) The ideology of seeking quick success and instant profits is prominent among enterprises, and the value of corporate culture is too low.

1.2. Research objectives

This paper aims to study the development of Qingdao Rongchuang Technology Co., Ltd.'s corporate culture, conduct in-depth research on the existing corporate culture of the company, analyze the specific presentation of the current corporate culture, and further explore its problems and deficiencies, and propose further optimization suggestions and measures for reference [3].

1.3 Scope of study

This survey takes Qingdao Rongchuang Technology Co., Ltd. as an example, which includes four departments: technology research and development department, marketing department, production department, and management department [4]. The job classifications include senior and middle managers, grassroots managers, and ordinary staff; They are divided based on ages below 30 years old, 31–40 years old, 41–50 years old and above 51 years old [5].

2. Literature review

In 1981, Richard T. Pascale and Antony G. Athos first proposed the "7S model" after six years of empirical research on 34 enterprises in Japan and the United States (**Table 1**)

Table 1. The "7S model"

Seven S	
Strategy	Enterprises can achieve their goals through rational allocation of various resources.
Structure	The characteristics of an organization.
Systems	Required reporting and routine procedures.
Staff	The important personnel classification within the enterprise.
Style	The behavioral characteristics that executives exhibit in achieving the highest goals of the organization.
Skills	The specific working abilities of an enterprise's personnel.
Superordinate goals	The best results the enterprise wants to achieve.

3. Research methods

3.1. Sampling methods

The characteristics of simple random sampling are as follows: the probability of each sample unit being selected is equal, each unit of the sample is completely independent, and there is no correlation and exclusion between them. Simple random sampling requires a limited number of samples. A total of 712 valid questionnaires were collected in this study [6]. The number of samples was less than or equal to 712 of the sample population. Simple random samples were taken one by one from the population. The probability of each individual in simple random sampling was 1/712.

3.2. Research variables

The independent variables are as follows: number of employees, position, age, and educational background of employees, corporate vision, corporate mission, and corporate values [7]. The dependent variable is the

corporate culture.

4. Data analysis

4.1. The reliability and validity analysis of the questionnaires

The evaluation system of questionnaire is reflected in the form of scales. A scientific and reasonable questionnaire design plays a decisive role in the availability and credibility of evaluation results. In this study, IBM SPSS V22 statistical software was used to test the reliability of the data obtained from the questionnaire [8]. Through the reliability test of the above questionnaire, Cronbach's A, and Cronbach's A based on the standardized item are both above 0.8, indicating that the questionnaire indicators and data can be used as the next research [9].

Table 2. Statistics' reliability

Cronbach's	Cronbach's A based on standardized items
0.800	0.815

4.2. Analysis of questionnaire data results

Table 3. Company scale score

Cultural characteristics	Dimensions of	Number	Score	Cultural characteristics	Dimensions of	Number	Score
Participatory	Authorization	1	4.19	Consistency	Core values	16	4.12
		2	4.13			17	3.99
		3	3.81			18	4.21
		4	4.02			19	4.10
		5	4.12			20	4.28
	Team orientation	6	3.88		Cooperate with	21	4.20
		7	4.23			22	4.18
		8	3.79			23	4.07
		9	4.40			24	3.51
		10	4.06			25	3.91
	Ability to develop	11	3.77		Coordination	26	3.89
		12	4.00			27	3.41
		13	4.09			28	3.55
		14	4.13			29	3.60
		15	3.09			30	4.02

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Cultural characteristics	Dimensions of	Number	Score	Cultural characteristics	Dimensions of	Number	Score
Adaptive	Creating change	31	3.58	Mission	Strategic direction and intention	46	4.11
		32	3.75			47	3.25
		33	4.01			48	4.19
		34	3.17			49	4.25
		35	3.93			50	3.85
		36	3.82			51	4.13
		37	3.51			52	4.13
	The customer is supreme	38	3.43		The target	53	4.32
		39	3.78			54	4.00
		40	3.63			55	4.02
		41	3.81			56	4.17
		42	4.10			57	4.16
		43	4.60		Vision	58	4.36
		44	4.44			58	4.32
		45	3.91			60	4.13

According to the preliminary analysis, the cultural characteristic with the highest score is "mission," which indicates that the company has lofty aspirations and clear goals, while the the adaptive characteristic scored the lowest, which indicates that the company faces great difficulties in adapting to changes in the external environment, and its development will be severely challenged in the face of the everchanging external environment [10].

4.3. Analysis of interview results

(1) Employees do not have a deep understanding of corporate culture and the core values and concepts of the enterprise. Many employees are clueless about the core values of the company [11].

(2) Low recognition of corporate culture among employees. The enthusiasm of staff to take initiative is low. Some employees think corporate culture is a matter of leadership and has little to do with day-to-day work, hence not needing attention [12].

(3) "Two-faced corporate culture and system." Many slogans in the construction of corporate culture is just all talk, contradicting themselves with the existing management system and various systems. Many of the things advocated by corporate culture are not reflected in the actual institutional system.[12]

(4) Corporate-culture-building activities are often mere formalities, and the actual effect, especially the improvement of corporate performance, is limited. The company has so far failed to demonstrate the role of corporate culture in improving performance, and there is no team spirit within the company [13].

(5) There is lack of emphasis on construction of corporate culture, and lack of organization, personnel, and capital support, so as to achieve actual results. Although corporate culture is often mentioned by the main leaders, but not enough is done in all aspects of the implementation of support [14].

(6) There is still lack of understanding of corporate culture among the employees. In the process of research, it is found that many employees have the wrong views that corporate culture is useless, corporate culture depends on leadership, corporate culture being equal to politics and ideologies, corporate culture being just a label, corporate culture being equal to cultural and recreational activities, corporate culture being difficult to achieve, and so on.[15]

5. Summary

5.1 Conclusion

Through the analysis of literature, interviews and questionnaires, prominent problems of the company's corporate culture construction were found to be as follows: the construction of corporate culture was not systematic resulting in it becoming a mere formality, the staff culture were low, and the cultural support for the strategy was obviously inadequate [16]. After several rounds of discussion and analysis, it was made clear to the company that the main task of the enterprise culture is to promote the enterprise excellent culture gene, rich cultural connotation and sublimation, and lastly to promote corporate culture, mainly through the following measures:

Firstly, the foundation of the company's corporate culture management needs to be consolidated [17]. Along with the company's management present situation and the problems in the cultural construction, this paper argues that the foundation of the enterprise culture management is the cultural influence under the background of the new era. The company's core value concept system needs to be reshaped, and the construction of institutional culture, behavior culture, material culture, need to be strengthened through new cultural elements and the connotation of the concept inspired and condensed employee, so as to rebuild corporate image and boost team morale [18].

Second, the construction of the company's corporate culture construction guarantee mechanism [19]. Enterprise culture construction guarantee mechanism is the effect of enterprise culture construction and the determinants of success or failure. Based on the current situation of culture management of the company, in terms of organization, planning, security system, and evaluation mechanism, the company should ensure systematic planning of the enterprise culture construction, ensure orderly overall layout with the introduction of assessment and evaluation mechanism, monitor the effect of corporate culture construction, analyze the advantages and disadvantages of management, promote the corporate culture construction work step by step for continuous improvement [20].

5.2 Future prospects

Management is a systematic project, and corporate culture management is an important part of the management system. However, due to the short study time of corporate culture theory and the relative insufficiency of enterprise management practice, there are certain limitations in the understanding and cognition of corporate culture construction. Therefore, this paper is unable explain the relationship and interaction between corporate culture management and other management modules systematically. However, through this short period of investigation and diagnosis of the company, it was found that the understanding of the industry of the employees is relatively superficial, and there is even some deviation. There is still a lot of room for improvement in the corporate culture improvement plan formulated on this basis, which also points out the direction of future management research.

Disclosure statement

The author declares no conflict of interest.

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Research on the Evaluation of College Teaching Quality Based on Student Satisfaction: A Case Study of Qingdao Hengxing University of Science and Technology

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Abstract: With the popularization of higher education, the quality of higher education has been the focus of society. With teaching in colleges and universities being continuously reformed, the means and methods of college teaching quality evaluation are also constantly improving, thus the traditional teaching quality evaluation method can no longer fully meet the actual needs of the current teaching quality evaluation in colleges and universities. As a scientific and systematic theory, the customer satisfaction theory has been gradually recognized by various industries, and has also been widely used in non-profit organizations. Colleges and universities under the non-profit service sector, and the focus is on whether their educational services can satisfy customers (especially students) based on the comparative analysis of customer satisfaction theory and customer satisfaction evaluation method, the model of teaching quality, and the index system and the corresponding measurement model [1]. On this basis, the teaching quality of Qingdao Hengxing University of Science and Technology was used as the research object, combined with the teaching service characteristics, and analysis of factors affecting customer satisfaction, which includes school reputation, perceived quality, perceived value, customer complaints, customer loyalty, students' satisfaction. The results were analyzed and suggestions are given to effectively improve the teaching quality customer (student) satisfaction.

Keywords: Customer satisfaction; Evaluation of teaching quality

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1. Introduction

1.1. The statement of the research problem

Since 2000, with the acceleration of the development of higher education in China, the scale is also expanding. The historical process of higher education from being for the elite to now for the public, and the methods to correctly evaluate teaching quality of institutions of higher learning has now been highlighted by many [2]. Therefore, it is of great significance to understand the degree of students' satisfaction towards the teaching quality to study the actual teaching quality of colleges and universities.

1.2. The objectives of the research study

This paper studies teaching quality based on real situations in current domestic colleges and universities, analysis of the students' satisfaction with the teaching quality, and quantify teaching quality using specific

measurements. Reasonable countermeasures and suggestions are then put forward to improve the actual teaching quality of ordinary colleges and universities [3]. The ultimate aim of this study is to provide some ideas and references for improving the quality of teaching in general universities.

1.3. The scope of the research study

The study was conducted between January 2021 and September 2021, for all the current students of Qingdao Hengxing University of Science and Technology based on the existing teaching quality evaluation [4].

2. Literature review: ACSI model of American Customer Satisfaction Index

The ACSI model was developed by Professor Claes Fornell and colleagues of the University of Michigan School of Business, and is currently jointly managed by the American Association for Quality and the National Center for Quality Research at the University of Michigan School of Business. ACS1 model is mainly composed of the national overall satisfaction index, department satisfaction index, industry satisfaction index, and enterprise satisfaction index. It is the most comprehensive system, the most convincing national customer satisfaction theory model, the theoretical basis for customer satisfaction and expectations before and after product or service consumption and purchase [5], and may lead to two results: customer complaint and customer loyalty. The structure of ACSI model is shown in **Figure 1**.

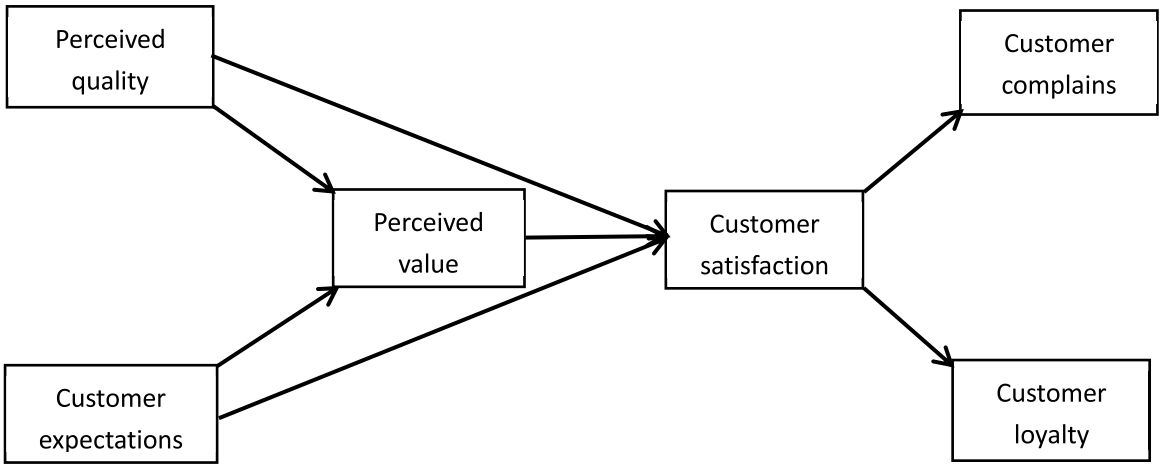

Figure 1. The American Customer Satisfaction Index Model

3. Research methods

3.1. Sampling methods

This paper is an actual questionnaire survey of the students of Qingdao Hengxing University of Science and Technology in 2021, using the random sampling method [6].

3.2. Variables

A basic overview of the influencing factors of the following:

(1) The level of school reputation;
(2) The level of customer-perceived quality;
(3) The level of customer-perceived value;
(4) The level of customer satisfaction;
(5) The level of customer complaints.[7]

4. Data Analysis Result

4.1. Analysis on factors of employment satisfaction in Hengxing University

According to the existing literature research and theoretical basis of teaching quality and satisfaction at home and abroad [8], as well as the actual investigation and research results of Qingdao Hengxing University of Science and Technology, there are five factors that affects the satisfaction of college teaching quality: school reputation, customer perception quality, customer perceived value, customer satisfaction and customer complaint. Relevant data was obtained from questionnaires completed by 111 students [9].

4.1.1. Customer satisfaction index calculation

Customer satisfaction index is generally calculated by a weighted sum method,
The formula is as follows:

$$CSD = \sum_i w_i x_i$$

CSD: It refers to the customer satisfaction index
w_i : Weight of the indicator *i*
x_i : Satisfaction score for indicator *i*

There are many methods to determine the weight of evaluation indicators, such as expert experience method, historical data method, and hierarchical analysis method. There are also methods that can determine the weight of the indicators directly based on the survey data, such as the average assignment method, the principal component method, and the factor analysis method [10]. Although the weight results obtained by the average assignment method have a high correlation with the comprehensive index, the difference between the results obtained by the three methods is very small [11]. Factor analysis was used to determine the index weight using SPSS software. According to the proportion of the factor analysis, the weights are shown in the **Table 1**.

Table 1. Weight value of each index

Variable	Initial	Draw	Weight	Satisfaction value
v1	1.000	.609	0.038319	3.2525
v2	1.000	.553	0.034916	3.1442
v3	1.000	.668	0.042669	3.2342
v4	1.000	.553	0.034918	3.3963
v5	1.000	.651	0.040967	3.3964
v6	1.000	.566	0.035925	3.5494
v7	1.000	.566	0.035927	3.5585
v8	1.000	.535	0.033910	3.3965
v10	1.000	.462	0.029249	2.9731
v12	1.000	.647	0.040902	3.0630
v13	1.000	.653	0.040966	2.8830
v14	1.000	.547	0.034603	3.7118
v15	1.000	.581	0.036743	2.8828
v16	1.000	.490	0.031011	3.2525
v18	1.000	.602	0.038068	3.2885
v21	1.000	.654	0.041410	3.1083
v23	1.000	.442	0.027856	2.7750

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v24	1.000	.477	0.03018	3.0992
v27	1.000	.491	0.03102	3.2616
v29	1.000	.534	0.033782	2.6579
v30	1.000	.675	0.042606	2.8195
v31	1.000	.513	0.032965	3.0812
v32	1.000	.674	0.042608	3.1263
v33	1.000	.492	0.031074	3.0452
v34	1.000	.471	0.029813	3.0093
v35	1.000	.436	0.027418	2.5498
v36	1.000	.695	0.043675	2.1626
v37	1.000	.578	0.036493	2.6309

The average customer satisfaction value was calculated to be 3.10 according to formula, which equals to 60.20% when converted to percentage, which is a bare pass, indicating that great efforts are needed to improve the quality of teaching [12].

4.2. Structural equation model fitting

In structural equation model analysis using LISREL software, the results are not accurate if the sample size is small, and the model fit and sum effect is not good enough. What the structural model needs to be verified is to influence relationships and paths in a wide range [10]. The sample size of 111 meets the sample size requirements and a unified path analysis can be conducted [13].

Using the structural equation model established in **Section 3**, the Correlation Coefficient Matrix was input, and LISREL software was initiated to process the data, and the result obtained are shown in **Figure 2**.

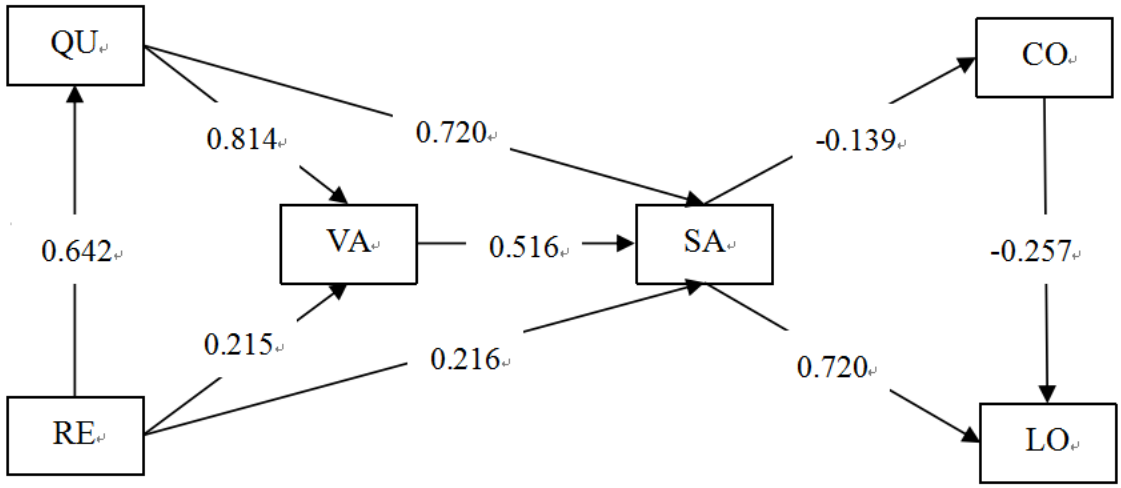

Figure 2. The path map of causality among the variables in the teaching quality customer satisfaction model

5. Summary

5.1. Results

Taking Qingdao Hengxing University of Science and Technology as an example, the teaching quality satisfaction were evaluated according to the weight and comprehensive score of the influencing factors, so as to improve the students' satisfaction with the college teaching quality [14].

Based on the factors of college teaching quality, such as customer satisfaction and customer loyalty, and

the combination of local and international results, and the specific conditions of colleges and universities in China, a measurement model of college teaching quality customer satisfaction was put forward, the six factors involved in the model were discussed in detail, and then a questionnaire was designed according to general observations [15]. The students of Qingdao Hengxing College of Science and technology were selected to carry out the investigation. After collecting the questionnaire survey data, an in-depth analysis of the data was carried out in terms of two aspects [16].

5.2. Conclusion

School reputation has significant influence on perceived quality, perceived value, and customer satisfaction. Perceived quality has significant influence on customer value and customer satisfaction, and customer perceived value has significant influence on customer satisfaction. Customer satisfaction has a significant effect on customer loyalty and customer complaint, and customer complaint has a significant effect on customer loyalty [17].

From the further analysis of the correlation coefficient, we can see that the main factors affecting the teaching quality customer satisfaction are perceived quality, customer perceived value, and school reputation [18]. The customer loyalty of teaching quality mainly depends on the degree of customer satisfaction of teaching quality, but at the same time customer complaints also have an impact on customer loyalty. The customer perceived value is mainly determined by the customer perceived quality of teaching service. The school reputation also has some influence on the customer perceived value [19].

In short, it is of great practical significance to carry out teaching quality customer satisfaction survey, especially in the critical period of quality engineering in higher education [20]. It is believed that the overall quality level of higher education in China will reach a new stage when the teaching quality, customer satisfaction survey and improvement are carried out in colleges and universities in China.

Disclosure statement

The author declares no conflict of interest.

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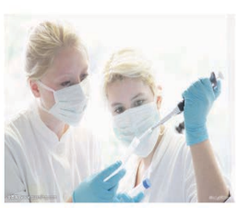

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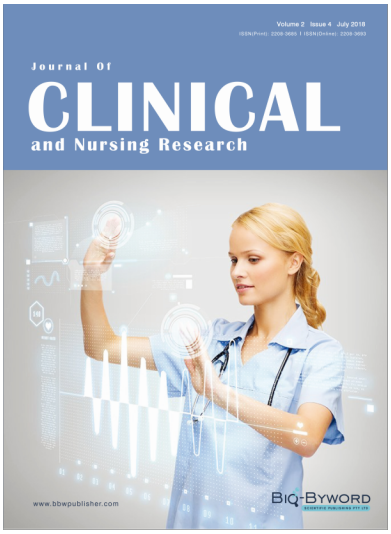

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