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Understanding Leaderships' Role in Teachers' Professional Development – A Secondary Publication

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Abstract: In an increasingly connected and interdependent society, collaborative culture emerges as an effective and efficient answer to overcome the complexities that teachers face daily. In turn, the teaching activity requires a continuous reflection on practice, involving the teacher in a constant search for professional development, as a reflective researcher. Now, the action of teaching, understood as a craft and an art that materializes in practice, requires grounding (specific knowledge and skills) and theoretical-practical reflection, aimed at improving the teaching and learning of students. For this purpose, the school must be thought of as a learning organization that expands and innovates with the development of professionals who work in it, which requires a new mode of operation from the leaders, the creation of favorable conditions for the continuous questioning of practices and a culture that values permanent learning and improvement. The study carried out in a group of schools in the Greater Lisbon area had, among others, the following objectives: (1) to identify the perceptions of leaders about supervision and collaboration; and (2) to understand the role of leaders in the professional development of teachers. From a methodological point of view, the investigation assumes the design of a case study, with a mixed approach, based on eight individual interviews with top leaders and twenty-one questionnaire surveys, applied to class directors. The results show different understandings of the concept of collaboration and the role of leaders in the professional development of teachers, perceived as an unfinished process and under permanent reconstruction.

Keywords: Collaboration; Professional development; Leadership; Supervision

Online publication: February 25, 2024

1. Introduction

The study aimed to identify the understanding of the principal, vice principals, and department coordinators regarding supervision and collaboration and to perceive their role in teachers' professional development. The research aimed to deepen and unveil the concepts of supervision and collaboration, a relevant binomial recognized as two core practices conducive to the quality of teaching and teachers' professional development. In the current educational context, increasingly complex and heterogeneous, collaborative supervision, as a formative, reflective, and transformative strategy, becomes pertinent both in sharing practices and problem-

solving and in promoting teachers' professional development. From this perspective, teachers' professional development stems from the idea of learning as a dynamic, constant, personal phenomenon resulting from interaction with colleagues, joint reflection, and sharing experiences.

In this regard, Decree-Law No. 55/2018 (ME) emphasizes the importance of cooperation among teachers, the valorization of collaborative and interdisciplinary work, and situations of co-teaching or the formation of pedagogical teams, as these are the expression and condition for the implementation of collaborative work among teachers [1]. Similarly, the Profile of Students Exiting Compulsory Education refers to the development of interdisciplinary projects and the importance of collaborative work in school, highlighting the role of leadership in organizing and implementing these educational changes.

This study grounds collaborative supervision in management roles, embodied in the figures of the principal and department coordinators who, in this sense, are responsible for supervision and collaboration actions, which directly commit them to the implementation of these practices and to changing teachers' ways of working. Given the current reality, the need for new dynamics in schools, and current legislation, the following objectives were defined, among others: (1) to identify leadership perceptions regarding supervision and collaboration; (2) to perceive the role of leadership in teachers' professional development.

The article frames the study, from a theoretical perspective, notably clarifying the concepts of supervision and collaboration, and highlights collaborative supervision as a device in the service of professional development, focusing on leadership action. It explains and substantiates the methodological choices and presents the analysis of data from the eight individual interviews with leadership. In the conclusions, the results are reflected upon in light of the theoretical perspectives addressed.

2. Theoretical framework

2.1. Concepts: supervision and collaboration

The study adopted an approach to supervision from an integrative multilateral perspective, meaning creative and constructive, democratic, participatory, and collaborative supervision focused on the quality of management as a whole [2].

Similarly, Gordon highlighted the clinical supervision process as a fundamental tool for the improvement of teaching and learning, an action of continuous accountability and action research by teachers [3]. It also considered supervision as allowing the sharing of more positive alternative experiences and strengthening a professional community that develops common values, realizing them through collective action.

In this investigative journey, a multifaceted meaning of the term supervision is recovered, with various connotative meanings, some of them resulting from its historical heritage, relating it to the idea of "inspecting, monitoring, controlling, evaluating, and imposing" [4], associated with a hierarchical relationship between the trainee and the supervisor. On the other hand, Alarcão and Canha differentiated between two modes of supervision: formative, stimulating, favoring "the development of people's and institutions' learning," and "inspective, monitoring, emphasizing control," assuming a more preventive or punitive dimension [5]. The same authors clarified that supervision, in its evolutionary line, is characterized as "a process of monitoring an activity and the person or persons carrying it out, aimed at facilitating the successful completion of the activity, the development of competence, and the satisfaction of the person(s) performing it" [5].

In this exploration of different meanings, supervision is considered as an intentional and continuous action involving a "broader context of the school, as a place and time of learning for everyone [...] and for itself as a qualifying organization that also learns and develops" [6]. New supervisory trends should be understood in a new educational context, as a necessary action for the construction and development of teacher knowledge, as

teaching professionals, "with an orientation toward guiding, formative, transformative, interactive, reflective, and empowering intentions" [5]. Therefore, supervision emerges as a strategic action plan, aiming at promoting academic success, as an intrinsic need of the teacher, a requirement for building, growth, and updating professional knowledge and action, aiming at improving pedagogical practices.

Regarding collaboration among teachers, it was understood in this study as a means to promote their professional development, the quality of teaching, and student learning, a privileged way of working to transform the institutions into true professional learning communities [7]. The culture of learning stems from shared work among various teachers and leaders, from an investigative and reflective stance on professional practices, and attitudes fostering professional learning. In this regard, Hargreaves emphasized collaboration as "one of the most promising paradigms that has emerged in the postmodern age [...] as an articulating and integrating principle of action, planning, culture, development, organization, and research" [8]. Similarly, Alarcão and Canha added that collaboration requires the will to accomplish with others. It implies trust in the other, valuing their knowledge, believing that with them, it is possible to go further [5]. It also implies humility in valuing our own knowledge and experience, admitting and desiring that they be modified and enriched by collaborative encounters [5].

Alarcão adopted the term "collaborative interaction" to emphasize the underlying interactive dynamics [9]. According to the author, these two associated concepts "create a new synergy and acquire a more potent meaning" [9]. Lima solidified the concept of professional collaboration as "the ideal way to ensure the professional development of teachers throughout their careers, excellent learning for students, and the transformation of schools into authentic learning communities," because "collaboration is not justified by itself: it is a means to achieve a nobler end; a richer and more meaningful learning for students" [10].

2.2. Supervision and collaboration: a powerful combination in building professional knowledge

Researchers who have delved into the theme of pedagogical supervision unanimously advocate for the collaborative dimension, emphasizing its contribution to teachers' personal and professional development. Thus, supervision and collaboration should be perceived as two accomplice concepts, fundamental in the service of development and the quality of teaching [5].

The concept of supervision has evolved in its understanding, influenced by the perception of the need for continuous training and its broad conceptualization of professional development processes, acquiring a more reflective and self-formative dimension. In this vein, various authors have evolved in their interpretations, driven by the challenges facing schools, the research conducted in this area, and the demands confronting teachers – those of continuous collaborative learning, based on practice inquiry, self-assessment, and shared pedagogical leadership. Gordon regarded supervision as a necessity for political action, teacher leadership, and schools that promote professional development [3].

Therefore, systematic thought on formative and collaborative supervision is a recent concept that has been gaining considerable importance in teachers' discourse and regulatory frameworks themselves. According to Alarcão and Roldão, this collaborative, self-reflective, and self-formative relevance gained prominence "as teachers began to gain confidence in the relevance of their professional knowledge and in their ability to make their voice heard as researchers of their own practice and builders of the specific knowledge inherent to their social function" [11]. Alarcão and Roldão considered that "when reflection is collaborative and collegial in nature, and focuses on investigative activity, problem-solving, analysis of educational situations, and interactions in diverse contexts, it presents itself as a strategy of great formative potential" [11].

This collaborative dynamic, converging with improved learning outcomes, is advocated by Bolívar in the sense of "understanding the school as a Professional Learning Community of teachers" and achieving sustained change [12]. We can, therefore, observe "evolutionary traits towards the promotion of professional development in a less hierarchical and more collaborative perspective, less guided by techniques and norms and more based on questioning, reflection, and personal assumption of decisions taken," which cannot be dissociated from "conceptions of training, professional development, evaluation, and quality, management concepts, institution/organization, nor can they be dissociated from the values and principles that, at a given moment, guide society" [5]. According to Alarcão and Canha, "collaborating is thus a tool that serves for the development of individuals and the activities in which they engage, and presumably also for the institutions in which they are inserted" [5]. In the same vein, Day emphasized that the concept of collaboration underlies a very strong potential for the professional development of teachers, as it enables education professionals to work together and test new strategies that enrich each one's practice [13].

Reinforcing this idea of lifelong learning, the document "The Future of Learning: Preparing for Change," published by the European Commission [14], presents a future vision of education, highlighting three aspects that will characterize it: personalization (person-centered learning), collaboration (learning in a social context), and informalization (lifelong learning, including informal).

According to Alarcão and Canha, supervision and collaboration are two concepts that intersect and combine with the intention of promoting development, quality, and transformation; furthermore, in contexts of collaborative training and learning, aimed at professional evolution, supervision emerges as an accomplice in this purpose [5].

2.3. The role of leadership in professional development

Schools, as organizations, constitute spaces where interactions, communication, and learning are fundamental, and therefore, it is the responsibility of top leadership to create favorable working conditions for continuous questioning of practices and to help develop in schools an environment and culture that values continuous learning and improvement, creating opportunities for teachers to learn collaboratively. In this regard, Moreira highlighted the importance of supervision as a promoter of reflection, transformation, and development: "In a democratic, situational-contextualized, and dialogical approach, supervision reveals itself in its humanity, 'empties' itself of authoritarian power, creates conditions for the exercise of freedom of expression and critical thinking, opening up space for the school, as a learning community and space for individual and collective transformation, to emerge" [15].

However, Fullan and Hargreaves pointed out that professional professionalism is not limited to "encouraging teachers to engage in a variety of continuous training actions. [...] shared leadership and access to resources are closely related [...]. The availability of resources, especially human ones, intended for collaboration, stimulates initiative and leadership" [16]. The behavioral attitude of the principal leads to the development of the school and the professionals working there, and their action is more effective when "always favoring collaboration" and involving teachers in decision-making [16]. According to Day, principals "must be leaders who articulate a global vision, who promote the sharing of ideas, and are committed to evolutionary planning, dealing with culture, development, and change" [13], as the "responsibility for the professional learning culture of the school is the central aspect of the cultural and educational role of school leaders. It is absolutely necessary to promote teacher development and, through this, school improvement" [13].

Day also highlighted the role of the principal in supporting the professional development of teachers, and "the main factors that allow assessing the effectiveness of school principals are their interpersonal skills

and learning orientations" [13]. In this continuity, the principal plays a fundamental role in creating cultures of professional learning by encouraging "teachers to engage systematically in individual and collective learning, formal and informal, individually and with others" [13]. Indeed, the responsibility "for the professional learning culture of the school is a central aspect of the cultural and educational role of principal leadership. It is absolutely necessary to promote teacher development and, through this, school improvement" [13].

In turn, middle leadership (department coordinators) also play a crucial role in the development of collaborative supervisory practices, which requires, according to Formosinho and Machado, that their action focuses "more on creating an atmosphere in which action takes place than on leading the action itself of each team, more on promoting the emergence and affirmation of intermediate teams than on directing all actions of the teams" [17].

Furthermore, the school, as a reflective organization, should emphasize the importance of the roles that department coordinators play in the functioning of the education system and, from there, "create a new spirit that, precisely thanks to this perception of our growing interdependencies, thanks to a shared analysis of the risks and challenges of the future, leads to the realization of common projects or, alternatively, to intelligent and appeasing management of inevitable conflicts" [18].

In the same vein, Fullan and Hargreaves stated that the development of collaborative cultures requires leadership that shares decision-making and emphasize that "it is not the charismatic and innovative leader who advances collaborative cultures; on the contrary, it is a more subtle type of leadership that makes activities meaningful, so that they participate in them" [16]. They further add that "the basic role of school leadership is to lead the development of collaborative schools in which teachers are given the possibility and capacity" to share experiences, openly dialogue with colleagues, and grow professionally [16]. Department coordinators should activate this sharing of experiences, stimulate positive professional interactions, and promote a joint work dynamic and training actions in schools. Assuming the role of supervisors, they can positively influence the regulation of pedagogical practices through their critical and transformative actions, contributing to the construction of an educational culture more committed to professional development processes. According to Alarcão and Tavares, supervisors should be facilitators or leaders of learning communities because their main function is to promote or support contexts of formative and transformative reflection that, translating into school improvement, have repercussions on the professional development of educational agents [...] and on the learning of students who find a place, time, and context for learning in it [19].

Alarcão and Roldão also highlighted the figure of the coordinator/supervisor as an element that influences the process of socialization, as they contribute to "expanding the vision of teaching, stimulating self-knowledge and reflection on practices, transmitting knowledge useful for professional practice" and for the "creation and sustainability of environments that promote construction and professional development on a sustained path of progressive development of professional autonomy" [11]. In this change process, the dimension of distributed, shared, and participative leadership is crucial because it commits and holds teachers accountable and is strategically fruitful for professional development.

Some authors argued that the leadership of department coordinators is the right path to developing successful schools, as they support teachers in the classroom and foster quality practices, teacher support, and coordination of teaching activities that lead to the personal and professional growth of teachers [20-22]. The coordinator is a leader with skills to, together with their peers, contribute to improving teaching and the quality of the school, functions listed in Decree-Law No. 115-A/98, of May 4 [23], and in Regulatory Decree 10/99, of July 21, art. 5 [24], which define their competencies, reinforcing those aimed at improving and developing professional learning communities.

3. Methodological choices

The study was conducted in a cluster of schools in the Greater Lisbon area and adopted a mixed methodological approach to address the objectives [25]. For data collection, we used the semi-structured interview survey, which allows us to "investigate phenomena in all their complexity and a natural context" and gather descriptive and detailed knowledge from data related to "people, places, and conversations" [26]. It fits into a case study as it adapts to the exploration of a "limited system" in terms of time and depth, in a specific context, using various sources of information and confronting different participants [25,26].

The semi-structured interview was conducted with the principal, two deputy principals, and five department coordinators. With this intentional strategy, we aimed to obtain distinct and varied responses, in line with the defined objectives, and to make some comparisons, as advocated by Bogdan and Biklen, who stated that "in semi-structured interviews, one can be certain of obtaining comparable data among the various subjects" [26].

The treatment and analysis of the data were carried out based on predefined questions, and once the information was collected, it was analyzed and interpreted. In this regard, Amado argued that, due to their "open and flexible nature, qualitative plans produce a vast amount of descriptive information that needs to be organized and reduced to enable the description and interpretation of the phenomenon under study" [27], allowing the researcher to uncover what the data "contain." In the process of categorization, we sought to "gather a greater amount of information at the expense of schematization and thus correlate classes of events to organize them" [28]. Content analysis and treatment of the results were carried out based on inferences and interpretation of the data.

4. Results: crossed perspectives

Of the three interviewees, the principal (Dirt) and two deputy principals (Adj1, Adj2), two are male and one is female, aged between 50 and 60; they hold a master's degree, with extensive experience in the field of teaching, but only two years of experience in the position of principal. The principal, a master's degree holder in School Administration and Management, stated that he considers this role a challenge and an experience that allows him to "put into practice what he has learned." Regarding the professional experiences essential for the performance of the position, he emphasized "knowledge of students, teachers, and staff, knowledge beyond the school boundaries," which demonstrates his comprehensive view of the position, associated with an awareness of the complexity of its functions, which, according to Fullan and Hargreaves, "can and should be strongly active and vital for effective leadership in the context of school culture. [...] such qualities provide routine opportunities for principals to express what they value, and what they can contribute to the school, without imposing their perspectives as threatening orders" [16]. This implies knowing the context, the school, the teachers, and the educational community.

The department coordinators (CdA, CdB, CdC, CdD) are members of the school group, with an experienced professional profile. Two participants hold a master's degree, with extensive experience in teaching and the role of coordinator; only one has two years of experience. They also emphasize the importance attributed to training for the performance of the position, particularly in the areas of pedagogical supervision, leadership, interpersonal relations, and collaborative work practices. They recognize, in addition to training in pedagogical supervision, the critical importance of leadership and conflict management skills.

Regarding the first objective, the understanding of leadership regarding the concepts of supervision and collaboration, the principal and deputy principals consider supervisory practice fundamental, as the

“development of teaching practices [...] sharing experiences” [Dirt] and associate it with “collaborative work, peer work inside and outside the classroom to [...] monitor [...] to improve/change teaching practice” [Adj1]. They also highlight supervisory practices because they contribute “to the professional improvement of teachers, of educational establishments, through the sharing of new experiences” [Adj2].

Although department coordinators converge on the importance of implementing supervisory practices, they consider them “important, if understood, not as part of an evaluative and regulatory process, but as a way of providing moments of joint analysis and reflection on practices and results” [CdA]. This same coordinator states that they should not have “a merely regulatory character, but [be] a continuous and dynamic process, based on sharing and joint analysis of the work carried out in the disciplinary groups, in identifying and resolving any difficulties.” Supervision is conceived as “a mediation process for continuous teacher evolution, aiming at professional progression/fulfillment, with an impact on the educational community” [CdD].

Regarding the concept of collaboration, there is convergence in the perception of the participants, highlighting at the same time the constraints at the structural, organizational, institutional, and cultural levels. The principal points out this difficulty by stating that “there are always adverse elements to change” and highlights some constraints that may hinder teamwork such as “the elaboration of teachers’ schedules; architectural spaces: rooms for collaborative work and computer equipment.” Although he emphasizes the importance of intermediate leadership in the development of collaborative work, arguing that “with the work and dedication of middle management, this situation can be reversed” [Dirt], he does not specify how and under what circumstances it can be achieved.

The department coordinators mention the following collaborative activities: development of lesson plans; development of assessment tools and educational materials; and preparation of the Annual Activities Plan. The activities take place in class councils, in disciplinary groups, and in the department. Two examples of collaborative activity are “exchange of materials and opinions” and “distribution of tasks,” which suggests that the collaborative practices listed are limited to joint practical activities, being very much based “on spontaneous generation and precariously and casually” [CdD].

Regarding the perception of teacher professional development, we believe there is a convergence of understandings. The principal advocates “continuous lifelong learning, but [it] should focus on the teacher; it should lead them to reflect on their practices and methodological strategies to improve the teaching and learning process”; thus, the “main responsible for their professional development is the teacher themselves.” [Adj1] emphasizes “increased motivation if their [the teacher’s] efforts are recognized by the institution and the community.”

Department coordinators perceive professional development as a “lifelong learning process,” with the teacher “having to be willing to invest” [CdC]. This interviewee uses the metaphor of “a semi-straight line that has a beginning but no end,” suggesting that it consists of lifelong learning. Another coordinator explicitly expresses their understanding of professional development: “ability to analyze and reflect on their practices, systematically and together with their peers [...] to assess results; reformulate strategies and ways of acting” [CdA].

5. Conclusions

The results obtained reveal a perception of leadership that is somewhat uninformed and superficial regarding the concepts of supervision and collaboration, showing a heterogeneity of perspectives, even though their impact on professional development is acknowledged. The results also indicate that supervisory practices do not

exist, and collaborative work practices occur in some groups occasionally, casually and informally, but do not persist in a generalized format. Recognizing some factors that hinder the implementation of these practices, they must be improved and continuously realized because we believe that any change requires a clear understanding of its purposes and actions, cemented through reflection and collaboration. In this dimension, we argue that professional action cannot currently be limited to an individual way of working because the complexity of educational situations demands collaborative work and reflective practice; hence the relevance of supervision, aiming at the personal and professional development of teachers, involving mutual collaboration and assistance among peers.

We are aware that establishing collaborative work in schools is not always easy because it presupposes that participants engage, take responsibility, and commit to the objectives and educational project. In addition to the aforementioned, a fundamental requirement is demanded, that of trust, allowing participants to have openness to question, present ideas, and accept each other's actions, in an environment of respect for everyone's work, in a dynamic, creative, and changing process, which is not always an easy process, considering the individualistic culture that persists in the Cluster. However, department coordinators, as pedagogical leaders in the performance of their roles, fulfilling the competencies involved in this action, can trigger collaborative practices by creating spaces for change and learning communities.

Dialogue and questioning about practices lead to the professional development of each individual and the collective of teachers, resulting from collaborative learning, based on pedagogical, dialogical, contextualized, and reflective leadership. However, for this culture to materialize, it seems equally essential that, for the exercise of the position, leadership participates in specialized training on supervision and collaboration practices, recognizing that these strongly reflect on the professional growth of teachers. Indeed, collaborative practices contribute to the development of professional learning communities, a promising strategy for the quality of teaching and learning, and the development of skills that undoubtedly lead to changes in pedagogical practices and more adequate solutions to problems and difficulties.

In summary, we find in Cluster X a shallow understanding of the concepts of supervision and collaboration, where the former appears associated with the teacher performance evaluation process, with inconsistent supervisory and collaborative practices, without continuity, and the latter is highly dependent on and centered on the management bodies, despite the recognition of the impact of supervision on the improvement of teaching experiences and professional development.

Regarding teachers' professional development, there seems to be a convergence of ideas and understandings. Leadership considers it fundamental, emphasizing lifelong continuous training. We believe that, in the supervisory process combined with collaboration, two dimensions need to be revitalized: observation and active listening, as teachers need to be challenged and unsettled, but in an enlightened and reflective manner. It is urgent, then, to open windows, change beliefs, and lead teachers to a positive perception of supervision practices, seen as constructive and promoting professional development, resulting from interaction and mutual feedback, teamwork, and joint reflection.

The school needs to be conceived as a space for experimentation, connected to the external world, a school seen and felt as a place of education and development; Education should then be synonymous with movement, fostering experiences centered on action, experiences, and encounters. It is also important to highlight the importance and role of teachers who, although not the sole responsible parties, must encourage change in the school and in themselves as decision-makers in curriculum development. It is essential to refocus the teaching profession for the 21st century, challenging teachers to value their training, seeing it as an unfinished process and in the constant reconstruction of knowledge and professional development. In this sense, we believe it is

necessary to foster reflection among teachers and carry out teamwork because, without the involvement and participation of teaching professionals, reforms in education will not succeed. However, these changes imply a new educational context, new ways of working, permanent interactions with colleagues, changes in the organization and culture of the school, the development of teamwork, and, above all, the teacher who plays a central role, depending on this the quality of the educational phenomenon.

Disclosure statement

The authors declare no conflict of interest.

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Education Design: Methodological Strategies for Task Based on Project Work in the Classroom – A Secondary Publication

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Abstract: This paper focuses on the design of tasks based on project work for the teaching-learning process in any discipline, appealing to collaborative and interdisciplinary learning which implies more than one subject´s knowledge. The new implementation of study plans in Mexico has hindered educational design due to constant changes and the inclusion of new technologies. This paper tackles the concepts of transmedia, media convergence, and interdisciplinary to propose an easier and more effective design of dynamic and interactive projects which could be carried out by stages: formative and summative assessment, and may result in real and meaningful learning which connects daily life with the acquired knowledge.

Keywords: Formative evaluation; Summative evaluation; Interdisciplinary project; Transmedia

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1. Introduction

This work aims to be a proposal to facilitate the design of educational projects and to create a bridge between two worlds that, in Mexico, nowadays, seem even antagonistic: on one hand, basic education, and on the other hand, upper secondary education. According to the new study plans and agreement number 11/06/221 regulating specific and extraordinary actions for the conclusion of the 2021–2022 school year and the beginning of the 2022–2023 school year [1], students are not allowed to fail a school year. This agreement is based on the notion that the third constitutional article decrees that education is a universal right. Consequently, the mere act of presence in the classrooms guarantees the obtaining of the corresponding certificates for basic education, without giving priority to the meaningful learning of the students.

Education is indeed a universal right that also allows the pursuit of new knowledge and life opportunities; however, it is necessary to mention the consequences provoked by the relaxation of academic rigor. The transition from basic education to upper secondary and subsequently higher education becomes increasingly difficult, thus closing the doors to many applicants. For this reason, it is necessary to seek new project designs

that allow teachers timely monitoring and relevant observation for proper correction and editing of errors before being evaluated. It may seem easy to follow a scheme of continuous education; however, it is necessary to take into account the network of cognitive, contextual, and emotional connections that must be put into relation to achieve the success of this task.

In the case of foreign languages, project work appeared from communicative approaches or the so-called "*approche actionnelle*" in French, although in Mexico, the level of foreign languages is low. According to the EF English Proficiency Index, in 2022 Mexico was ranked 88th out of 111 evaluated countries, reporting a very low proficiency level. It is evident that other foreign languages, such as French or German, fall below this percentage. Consequently, it is necessary to problematize which aspects need to be reinvented in education, taking into account that, within the framework of globalization, it is already impossible to delimit a discipline in an isolated framework.

In contrast, the interaction between various disciplines that can expand both the teacher's and the student's horizon of expectation becomes increasingly necessary. Thus, concepts such as interdisciplinarity and multiculturalism acquire new importance, but how can we translate these global concepts into a local reality? It is important to question how it is possible to adapt a project based on a specific context, and what is the concrete purpose of each of the desired learning outcomes. For this reason, this work presents a proposal for project design not only focused on teaching and learning languages but also on different ways to exploit the interrelation with the environment, with the new study plans, and the new technologies.

2. New educational plans for basic education in Mexico

The new curriculum proposed by the Secretariat of Public Education (SEP) in Mexico aims to foster a new relationship between school and community, focusing on four formative fields: language, knowledge and scientific thinking, ethics, nature and societies, and from human to community. The distribution of these formative fields is complemented by articulating axes that, in theory, provide specific objectives and develop knowledge adequately through the experience of meaningful learning.

The new SEP 2022 plan resembles the proposal of the International Baccalaureate for the Middle Years Programme (MYP), adopted in Mexico in 1994. Currently, this program is aimed at students between 11 and 16 years old and comprises eight formative fields: language and literature, language acquisition, individuals and societies, sciences, mathematics, arts, physical education and health, and design. These groups of subjects can be compared with the four fields of the national program. However, there are substantial differences between the national curriculum and the well-established proposal of the International Baccalaureate Programme, mostly implemented in Mexican private-sector schools. The MYP requires at least the annual configuration of an interdisciplinary learning unit that allows for collaborative learning.

According to the International Baccalaureate Organization (IBO), "Students demonstrate interdisciplinary understanding when they can integrate concepts, methods, or forms of communication from two or more established disciplines or areas of knowledge to explain a phenomenon, solve a problem, create a product, or pose new questions in ways that might not have been possible from a single discipline" [2]. This interdisciplinary model is intended to be replicated in the new SEP 2022 curriculum. To achieve this, it will be necessary to consider that a deep understanding of interdisciplinary mechanisms by teachers, as well as the tools they can use to design, construct, and evaluate projects, will be decisive in their development and success.

According to the SEP, teacher training establishes bridges between the knowledge proposed in the curriculum and the teacher's knowledge, although it does not specify which knowledge it refers to. Various

competencies range from scientific knowledge, the formation and consolidation of ethical values, the ability to adapt to the environment, the didactic strategies provided by experience, and planning and design methodology. The SEP has also proposed the co-design of study programs by teachers, indicating that this will allow them to take ownership of the approach and content of the new plan and develop curricular autonomy. However, this appropriation will also take place among students since one of the objectives is precisely the ability to apprehend the environment in which they live; "knowledge implies a way of appropriating reality through multiple knowledge, experiences, and practices that converge in this appropriation" [3]. Thus, a defined objective has been proposed, stated in the guide of the new plan, "the formation of a new citizenship in which the principles of solidarity, substantive equality, social justice, interculturality, environmental care, inclusion, and human rights prevail, especially the rights of girls, boys, adolescents, and young people" [3]. Undoubtedly, in the face of defining the goal, it is necessary to develop strategies that allow for a successful outcome, both individually and collectively, considering that academic knowledge and ethical values are proposed without suggesting a specific methodology.

On one hand, the SEP has proposed the development of national curriculum design strategies. It is worth noting the need to clarify what kind of strategies, as well as the different contexts where they can be put into practice. It is crucial to understand that there is a wide range of socio-cultural contexts that hinder the practices of some projects. Some communities do not have the necessary resources to have an electronic device, or places lacking internet access. Although there is increasing access to cyberspace, this does not mean that users use it for study purposes. In this essay, the use of media is proposed as a way to connect the environment with students. Therefore, each teacher must be clear about the conditions in which they operate and the mass media available to them. However, the media are present in everyday life, even television and cinema are now references for cultural expressions.

To be able to combine different media, it is necessary to clarify what we want to make visible to the students and, at the same time, determine if knowledge acquired through other subjects can intervene in this approach. In the case of foreign languages, it is possible to propose a project on global migration that shows how the use of English, French, or Spanish has changed over the last decades due to constant and often forced migration. This approach appeals to a current and relevant reality that requires reflection. Likewise, to problematize this issue, knowledge of geography, history, and an ethical perspective is necessary. At the same time, it seeks to promote values of empathy and solidarity.

It is worth noting that combining knowledge does not necessarily mean carrying out an interdisciplinary project. There are significant differences between multidisciplinarity and interdisciplinarity. Multidisciplinary projects address the same problem from their specific area of knowledge without changing their work methodology. On the contrary, interdisciplinarity can combine methodologies and concepts to obtain more complex conclusions or solutions. So-called transversal projects involve teamwork (the same concepts interacting in different disciplines). For this reason, it is essential to observe the difference between a multidisciplinary project and an interdisciplinary one since, in the latter, the integration of two perspectives in solving the same problem is suggested to achieve a more elaborate result. The IBO asserts that interdisciplinarity should motivate students to understand a study object from different points of view, appealing to the development of understanding or empathy skills; through this process, students not only acquire lasting cognitive learning but also "demonstrate interdisciplinary understanding when they can integrate concepts, methods, or forms of communication from two or more established disciplines or areas of knowledge to explain a phenomenon, solve a problem, create a product, or pose new questions in ways that might not have been possible from a single discipline" [2].

Teachers need to establish meeting points between both programs: the new SEP curriculum and the international curriculum; however, it is equally important to analyze the similarities and differences found within the implementation of each curriculum. Although both programs propose comprehensive learning through the combination of everyday with academic learning, as well as the development of soft skills and ethical values, interdisciplinarity implies a detailed observation of reality and its socio-historical processes. This represents a challenge beyond the classrooms, as it appeals to the daily interaction of students with their families, and friends, on social networks, and other applications. Individual context directly impacts the consolidation of meaningful learning, therefore, the greatest achievement of the latter will be stimulating the capacity for analysis, critical thinking, and openness to new perspectives. How is it possible to develop these skills in such a heterogeneous school context, focusing on Mexico?

Understanding what is considered foreign brings a new perspective that allows for broadening horizons, both in experience and expectation. One way to understand the foreign is through the confrontation of the familiar. It is possible to present situations that arise in different contexts, problems to which one is not accustomed; the contrast and analysis of digressions consolidate anchoring points, as well as differences. Zygmunt Bauman explains that what is perceived as "foreign" or "distant" causes discomfort and uncertainty, "being far away means having problems: it demands lucidity, skill, cunning, or courage, learning strange norms from which one can do without elsewhere, mastering them through risky trials and frequently costly errors" [4].

While the Mexican context is very particular, the International Baccalaureate Organization (IBO) plan was taken as a basis because it is the first curriculum implemented globally, proposing comprehensive learning, just like the new national curriculum. It is worth noting the multiple similarities, even in the division of areas of knowledge. However, to achieve this, a deeper understanding of the means and ways of how to educate the population and what means we can have at our disposal to achieve it is necessary. Project-based work is undoubtedly a very useful strategy for addressing learning units, avoiding, as much as possible, the gap between students and the educational backlog. Projects suggest constant feedback and highlight the importance of evaluations as a formative rather than punitive measure, as in past decades. One way to understand this is by establishing the difference between formative assessment and summative assessment.

3. Formative and summative assessments

To understand the design of a project, it is necessary to define the stages that comprise it. In this case, we refer to formative and summative assessments, which are defined below. Since the 1960s, these terms have been popular and gained importance in the educational field. However, it remains to be defined when they are used and whether they are opposed or complementary.

Traditional education involves a numerical grade for each assignment. Subsequently, the average of all assignments is calculated, and a final grade is given. The new proposal consists of students carrying out non-numerical formative assessments that allow them to reformulate, edit, and correct their errors until reaching their final version. The goal is to help in their learning process so that they can correct or reformulate themselves in case of mistakes. Formative assessment informs the teacher of the student's learning progress during the teaching process; that is, it refers to continuous and constant assessment. It is important to remember that assessment does not necessarily have to be numerical or quantitative. The final result can be evaluated with a rigorous rubric, after having edited it previously.

On the other hand, summative assessment is used to measure final performance or the achievement of an educational objective. Formative assessment is more common in classrooms, as it refers to small activities

and tasks, and is used to guide the teaching process, while summative assessment is carried out at the end of a teaching period to measure overall performance.

If both are seen as complementary parts of a process, it will be easier to understand that the teacher is not at a crossroads, choosing the type of assessment, but rather will seek to integrate both parts into a whole oriented towards comprehensive learning. Formative and summative assessments are carried out on a small and large scale. Each learning unit integrates a project that addresses key concepts for meaningful learning of a specific topic; however, we could say that each learning unit is a formative assessment that prepares both students and teachers for the summative assessment at the end of each school year.

Continuous assessment favors performance observation, as long as it has well-defined objectives and expectations consistent with the environment and context of the students. Likewise, it aims to promote self-criticism and self-assessment to become aware of the importance of education, its advantages, and its impact on the community where one lives.

Generally, assessment is not an isolated concept. Like other concepts that can be coined in different disciplines, assessment interacts with others such as "feedback." This is essential for meaningful learning; it is a way of support and link between the student, the teacher, and the object of study. For this reason, a large part of attention must be focused on this process. The tasks to be performed must be supervised and monitored, in addition to establishing methods to stimulate good performance continuity. An unchecked task contributes to reducing the student's learning expectations and loss of motivation.

It is important to note that assessment should encompass the knowledge acquired, but also the procedure developed by the student, the attitudes, and the integrity demonstrated while doing it; that is, without plagiarism, with honesty, with solidarity in the case of group work, as well as the objectives intended to be achieved. The teacher also obtains feedback from the students on what their areas of interest are, generational trends, and how these relate to the concepts learned. Students build a generational bridge between the teacher and the object of study that can be reinforced by the media in different disciplines.

4. Transmediality and intermediality as didactic means

The term "transmediality" was first introduced in 1992 by the scholar Henry Jenkins. In his work "Textual Poachers: Television Fans & Participatory Culture," Jenkins defined transmediality as the ability of a story or character to move across various media platforms [5]. Julián Woodside simplified this term by stating that "transmedia refers to the practice of storytelling or communicating concepts in a non-linear manner using various media platforms" [6]; for example, a comic book character that also appears in a movie or a video game is transmedial, like the Avengers characters. However, Woodside also warned that "while this is not exclusive to digital environments, its popularization is related to the fact that such tools have allowed content creation economically, as well as facilitating access for the audience to 'jump' from one to another to complement their experience" [6].

In these cases, the aim is for the viewer to have a coherent and consistent experience across all media. Additionally, Jenkins complemented this idea with the term "media convergence," which he defined as "the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behavior of media audiences who will go almost anywhere in search of the kinds of entertainment experiences they want" [5].

This definition, which was introduced in the literary context, is now crucial in other contexts and disciplines involving mass media, such as film, education, music, etc. Transmediality and media convergence

are concepts that allow us to closely observe technological interaction, not only between technology and the arts, but also between technology, the arts, different societies, audiences, and socio-historical change processes; all these factors act together shaping the reality in which we live.

Furthermore, we find the concept of "expanded media," which refers more to the way media are used than to an object; in other words, Jenkins states that "this circulation of media content—across different media systems, competing media economies, and national borders—depends heavily on consumers' active participation" [5]. Collective participation is indispensable for knowledge construction.

Through media, it is also possible to expand dialogue among people from different nationalities and ideologies, as Zygmunt Bauman pointed out, physical boundaries have faded in cyberspace [4]. Jenkins then appealed to collective intelligence, resulting from the active participation of a community. "None of us can know everything; each of us knows something; and we can put the pieces together if we pool our resources and combine our skills" [5]. The search for collective intelligence is relevant in a classroom where brainstorming is commonly used to assemble a global idea. It is important to understand that knowledge construction cannot aspire to be universal or absolute. For this reason, it is possible to use different media that promote cultural and academic enrichment. Collaborative projects do not necessarily have to be carried out in teams, but it is important to know that collaboration can occur at different levels, such as interdisciplinarity (collaboration between two or more disciplines) and transmediality (collaboration between different communicative media).

However, transmediality does not necessarily imply the use of technology within the classroom, considering the limitations of school infrastructure in some cases. However, the connection between daily life within the framework of technological advancement is essential for new educational plans. Transmediality appeals to the mass media present in the students' environment, not only on the Internet but also as communication media in different formats. The project design can appeal to printed or digital newspapers. Decades ago, the use of newspapers and magazines was common in basic education to identify images, cut, or illustrate concepts. Currently, this possibility of illustrating concepts has grown thanks to a wide range of mass media, such as social networks, the increase in interactive publications like comics, manga, graphic novels, etc., television series, movies in theaters, and music videos. Many free applications allow viewing, creating, or exchanging videos, documentaries, biographies, and other materials. Some examples are YouTube, TikTok, and Instagram.

On the other hand, social networks now fulfill a socialization function and create an alternative space where mechanisms of commercial, social, labor, and even romantic exchange develop. As Zygmunt Bauman had warned, cyberspace is now a reality. Initially, Modernity was characterized by constant progress in means of transportation; one can evoke numerous inventions such as the subway, airplane, and automobile towards the end of the 19th and beginning of the 20th centuries. However, Bauman pointed out that, in our time, there is an innovation in transportation, "a technical factor that had a particularly important function was the transportation of information: a type of communication that requires little or no displacement of physical bodies. Likewise, new technical means were constantly created to allow information to move, regardless of its corporeal carriers, as well as the objects about which it reported" [4].

This technical factor defined by the Polish philosopher can be identified on the internet and in all the applications currently used by a large part of the world's population. Cyberspace has become an alternative space where a parallel reality develops, and where, of course, it is necessary to make visible the role played by education. It is worth noting that it is impossible to overlook the role of cyberspace in current life since, if we were to do without media and virtuality, especially after the pandemic, education would present a strong gap between reality and what is understood from it. Hugo Zemelman had already pointed out that there was

a gap in thought, affirming that “the use of concepts without a clear meaning causes the constant need for re-signification (...) resignifying arises from the gap between theory and reality because the pace of reality is not the same as conceptual construction” [7]. Bauman added to this idea some years later, when the gap is more visible: “the separation of information movements, their carriers, and their objects allowed, in turn, the differentiation of their speed; the movement of information underwent much greater acceleration than that of bodies or changes in situations about which it was reported (...) information is available instantly worldwide” [4].

In this context, teachers face the challenge of learning and unlearning what exists as the norm, since changes are constant and accelerated. Media can be great allies in class preparation because they bridge the gap between the real world and cyberspace, connecting what happens in Mexico and other countries, and it’s possible to find information in any language. Transmediality allows for a more cordial teacher-student approach, in sync with their interests and the social and communicative changes happening around them. Also, it’s important to know that the media provide limitless information. Now, the role of the teacher is not to provide information for memorization but to explain its use and utility in daily life. For this, projects are extremely useful, as they present issues within a familiar context where students can solve problems or formulate useful ideas for their lives and appreciate the acquired knowledge.

5. Project-based learning

The first step in designing a meaningful project is a concrete and clear definition of the objective. Establishing specific objectives from the outset helps students carry out the project simply and effectively, as well as promoting overall understanding. The importance of this lies in providing direction for the activities to be carried out and, on the other hand, demonstrating their utility. If the objective is not clear or does not show the importance of the project, it will be difficult for students to feel motivated to create or develop an activity that they find of little use or that does not represent any connection to their daily lives. The teacher needs to establish a connection between the designed project and the student’s daily lives. In this way, they may even discover new reasons to learn; that is, solving everyday problems, explaining facts and processes, organizing and analyzing information, etc.

The second part consists of defining the basic concepts, such as keywords, in a learning unit. This unit should address various topics that need to be integrated into the implementation of the work, as well as focusing on the detailed understanding of each concept and identifying how it can relate to problems and daily life. It is worth noting that the concept is not a topic, but a keyword that serves as a guideline in the set of the learning unit, present in various topics of the same, for example: “problem,” “perspective,” or “displacement.” These are understood in different ways in different subjects such as mathematics, art, physics, or literature; however, to engage them in dialogue in different disciplines, it will be prudent to start with a detailed understanding of each one.

Each keyword allows for the development of a complex idea, which can be manifested through the completion of a task. This task should demonstrate the students’ conceptual understanding, involving activities of reformulation, representation, and interpretation. The final product (summative evaluation) will be the result of several small activities (formative evaluations).

Another necessary action is to determine the timing for the completion of the project before starting. Students must be very clear about the deadlines. It is advisable to always leave a margin of two or three days for submission, depending on the teacher’s workload; that is, if the partial or final submission is requested for a specific date, it should be two or three days earlier than the deadline for grade submission, in case of

an unforeseen situation or a delayed submission. To prevent students from falling behind, it is preferable to organize the activity in stages. This will allow for the distribution of work for both students and teachers and will enable teachers to monitor the individual and group progress of students. Each stage can be defined as a "task" and considered as a "formative evaluation."

It is worth noting that, currently, the concept of "homework" cannot be the same as it was a few decades ago, which was understood as complementary work at home to school hours. Now, homework resides in the interrelation of learned concepts with daily life, seeking utility for learning within the experience and interaction with the environment. The project should be carried out in the classrooms, with the help of the teacher and the exchange with peers, thus suggesting the home and family as a place for leisure and reflection on learning through dialogue and interaction. Therefore, "homework" should be understood as the assignment, the work to be done, or the result of effort and reflection that leads us to solve a problem or make a significant contribution. The task is concretized through the project, which consists of several small tasks carried out to reach the final result. Following this model, the small tasks represent formative assessments (Example: Step 1: information search, Step 2: summary of main ideas, Step 3: discussing these ideas as a team, Step 4: writing a critical essay in two phases, draft and final submission). These can be submitted weekly to monitor students' progress. The final submission represents the final product, in this case, the critical essay, previously corrected by the teacher and students.

To verify if the project has fulfilled its purpose, it is not enough to confirm that the general objective exposed to the students has been met. As teachers, it is necessary to carefully observe the relationship that each individual has established between a concept and their reality, as well as the way of presenting it within the project. This allows us to get to know the students and establish empathetic relationships that give us clues about their interests, hobbies, etc., which allows us to create and design more efficient projects in subsequent learning units. Each concept should have a close relationship with the central idea presented in the unit, as well as an interrelation among the concepts that have been addressed, as each one will be an essential component of the main idea. The reaffirmation of this latter is the answer to the questions posed in the initial formative activities and the result of the student's experience and interaction.

Finally, it is important to highlight the importance of defining the evaluation method; that is, whether a rubric will be used, whether a numerical scale, percentage, how many points each submission is worth, etc. Likewise, it is necessary to understand that the project is not an exam, but it should reflect the overall and detailed understanding of the concepts. A valuable tool is the use of a rubric, individually designed, which represents for each teacher a unit for monitoring and evaluating learning in real terms. Jesús Torres Gordillo and Víctor Hugo Perera have synthesized the concept of rubric as "a versatile tool that can be used in very different ways to evaluate and tutor students' work. On the one hand, it provides the student with a reference that provides feedback on how to improve their work. On the other hand, it provides the teacher with the possibility of expressing their expectations about the learning objectives set" [8].

In this way, each teacher can design a personalized rubric for their quarterly or annual work, as the case may be, to better communicate what each project should present and how the student is expected to assimilate this information. This rubric depends on the purpose of the evaluation; that is, for the student to demonstrate a global understanding of the topic, which can vary, and it is possible to add other components, such as student engagement, timeliness of submission, etc. Likewise, it is advisable to use an answer key, in case of having a question and answer exercise. This key will facilitate the correction of assignments, saving time that can be dedicated to observing the environment and areas for improvement. Similarly, exercise keys can be shared and exchanged among teaching colleagues, promoting interaction and interdisciplinary planning.

6. Conclusions

Currently, we live in a world that can no longer do without technology; but at the same time, it is necessary to preserve the ethical side of human beings. Through educational projects, we can attempt to combine learning experiences with the practical application of ethical values, such as solidarity, mutual respect, and human dignity. When interacting with other members of a group, students appeal to exchange and the development of emotional skills, which seem increasingly scarce. Faced with an era change like the one we live in, it is essential to reinforce the idea that learning is not limited solely to the cognitive or to the storage of information; nor to mere social skills. It is necessary to understand that both parts are necessary to achieve a balance and a process of adaptation to an era that abruptly broke with the customs of the preceding decades.

This essay aims to contribute to the new educational design, which can reduce as much as possible the gap between those who navigate daily in the media and those who cannot access it so easily. It is necessary to adapt projects to our own context and to achieve this, it is necessary to know the structure of the plan, the cognitive cores, and what their purposes are. However, we cannot ignore that cyberspace is a new reality where education needs to become increasingly visible to be part of it. Education is a life tool to create social harmony; therefore, we cannot leave behind innovation in teaching and learning processes. It is necessary to appeal to constant dialogue, new proposals, and criticism, both from specialists and from basic and higher education teachers, as only by working together can the gap between the two be reduced. Project work provides a collaborative perspective, not only in the sense of solidarity among peers but also among the various disciplines as a living and changing object of study that mutually reinforces itself. Similarly, media convergence is observed, which enriches the learning experience, making it more sensory and closer to reality.

For the successful design of a project, it is necessary to define in advance the working method, the applications or materials to be used, the delivery methods (virtual platform, physical delivery, printing, etc.), as well as the creation of formative stages and definition of learning in the summative stage. Clarity is key in communication between teachers and students.

To conclude, it is worth noting that in this textual space, project work has been problematized without reference to a specific subject. The theoretical foundations indeed come from sources based on foreign language learning and literature; however, this does not mean that these strategies are specifically for language teaching. One of the objectives of this work is precisely to promote interdisciplinary collaboration. Language is present in all aspects of our lives and is fundamental for understanding the world and developing thought; however, other factors affect the construction of that individual worldview. Consequently, the aim is to delve into how knowledge relates to a specific situation to create solutions. Sciences, mathematics, and arts can enrich and affect the perception that an individual or a collective has of the world. Likewise, one culture can influence another, thus changing thought.

Likewise, the proposal presented here appeals to various cultural, academic, mass media, and popular culture manifestations to integrate the school world with daily life. In this way, the aim is to build a bridge between knowledge and reality, between the abstract and the concrete, and to create the necessary skills to understand the world around us. Thus, we can build a reality based on values and mutual respect, which truly puts meaningful learning into practice for the benefit of collective well-being.

Disclosure statement

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Research on the New Curriculum Module and Exhibition Evaluation Mechanism of Art Education

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Abstract: In response to the deepening reform in the field of education in China, major art education colleges have conducted in-depth analyses of learning topics such as art education and art communication, based on their own educational and teaching needs, academic demands, and operational characteristics. The aim is to establish a cognitive concept that differs from the general depth and cognitive level of thinking, tending towards essential analysis, and to consider art education as the ultimate goal of its own disciplinary development. A new pattern of art education in the public art education bureau's large classrooms has been gradually constructed. Building upon this, this article analyzes and studies new ideas for setting up art education curriculum modules, the new language of art education dissemination and exhibition, and the new development of art education dissemination and exhibition. The objective is to provide references for education departments and institutions at all stages and to offer theoretical assistance for improving the effectiveness of art education.

Keywords: Art education; New curriculum template; Exhibition evaluation mechanism

Online publication: February 25, 2024

1. Introduction

Against the backdrop of deepening reforms in the field of education, major art colleges should strive to innovate curriculum and teaching modules, update new ideas for educational and teaching work, and provide clearer ideological guidance for the development of art disciplines and the smooth implementation of educational and teaching activities, thereby expanding broader thinking and practical space. The ultimate goal of this approach is to encourage students to form a forward-looking logical thinking system for the subject of art [1]. Based on this premise, educational institutions and major art colleges in China should actively explore the practical path of new curriculum modules and exhibition evaluation mechanisms in art education. This exploration should take into account the actual situation of education and teaching, as well as the basic learning situation of students, in order to improve the quality and effectiveness of art education. The aim is to lay a solid foundation for students to better absorb and understand art knowledge and to promote their personal comprehensive development.

2. New ideas for setting up curriculum modules in art education

Throughout the innovative development of human civilization, it has transitioned from a primitive, macro-vulgar development state to a micro, high-speed development state, undergoing at least five spatiotemporal concept reforms and innovations. Chinese excellent traditional culture serves as the primary creator and carrier of most spatiotemporal views in human civilization. Presently, some individuals have adopted technology, art, and other cognitive models to guide their thinking. The simultaneous integration of external and internal cognitive models presents a significant cultural development challenge in the new era [2]. This dilemma encourages individuals to actively avoid stagnant thinking, reducing the tendency to focus solely on tangible objects within society and emphasizing skills and self-determined technological paths. This proactive approach notably impacts curriculum module design, transitioning from the traditional focus on artistic skill training to cultivating and enhancing the ability to construct world model representations. This transcends the notion of "seeing is believing" and delves into determining one's own path, employing the wisdom of scientific application philosophy and social science thinking to analyze and comprehend the inherent laws of material evolution.

The China Academy of Fine Arts Education conducts analyses on academic topics such as art education and art communication based on its academic demands, basic learning situations, and educational needs. The objective is to enhance the quality of art education and the overall effectiveness of teaching through an educational philosophy rooted in logical thinking of art and aesthetics. As the architect, organizer, and implementer of art education and knowledge dissemination activities, the Academy of Fine Arts Education faces the evolving trends of reform and development in China's education sectors. Its primary function is to recognize and comprehend the intricate interrelationships among various fields and factors, then progressively construct and refine the curriculum system through analysis and research. Only through this approach can a comprehensive understanding and forward-thinking work methodology be achieved. Focusing solely on the sparse and fragmented phenomena, and employing singular and generalized understanding and cognitive thinking, will lead to rigid educational perspectives, hindering innovation in art education curriculum modules and exhibition evaluation mechanisms, thereby impeding applied education.

The Academy of Fine Arts Education organizes art education activities, differing from teacher training colleges. Embracing the educational principle of "learning for application," it endeavors to transcend the constraints imposed by external learning ideologies, actively exploring the origins of art, culture, and civilization, thereby guiding the ideological direction of future literature and art development [3].

3. New development of art education communication and exhibition

In the process of designing and creating artistic practices, artists primarily undergo two levels of abstraction. The first level of abstraction involves transforming the intuitive representation of external phenomena into cognitive representations with ideological consciousness, establishing a dependent relationship with external elements as cognitive subjects. The second level of abstraction is demonstrated through the rational application of cognitive representations produced by consciousness and ideological spirit across various media transformations. This ultimately impacts human emotional perception channels and perceptual cognitive levels, expressed in a logical language known as "expression".

In the evolution from "creation" to "heart source" to "speech", artists employ explicit tools and unique operational regulations. This process often yields uncontrollable and serendipitous artistic effects. Consequently, artists maximize the use of artistic expression forms and language corresponding to these perception channels to convey their ideas [4]. Through conveying emotions via mediums such as pictures, music,

dance, and architectural art, individuals achieve their unique artistic expression and evoke a certain level of artistic contagion. The richness and freedom of artistic expression stem from the generation of perception and synesthesia due to multiple perception channels directed toward consciousness manifestation.

The multimedia presentation form of art education primarily involves breaking the monotonous visual perception channel of art and transcending the cognitive limitations of utilizing painting as the sole medium of communication. It aims to reflect the deeper-level thinking logic structure not evident on the surface. To establish connections with external objects, a perception channel closely linked to human ideological consciousness in the perception center is essential. The perception channel serves as a conduit for receiving internal and external information and transmitting it to the outside world, possessing inherent prescriptive characteristics.

Art teachers should accurately extract and summarize various forms of artistic expression, their characteristics, and their expressive capacities in educational activities. Beginning with abstract phenomena in basic language and writing, teachers should transform summarized and refined vocabulary into more intuitive expressions. Students employ creative new grammar to comprehensively grasp the expression intentions and conceptual thoughts embedded within various artistic communication vocabularies. During practical teaching, instructors should guide students to immerse themselves in high-level artistic language and expression activities. This facilitates a gradual departure from the passive and restrictive nature of personal comparison in sketching, encouraging active utilization of various artistic languages to convey thoughts and intentions.

4. New development of new curriculum modules and exhibition evaluation mechanisms in art education

The judicious application of new curriculum modules and exhibition evaluation mechanisms in art education practice teaching not only innovates the teaching format of art education but also enhances its quality and effectiveness. It fosters students' deeper comprehension of the fundamental disparities in the underlying logical frameworks supporting cognitive civilization, gradually cultivating a sense of discernment. The rational concept of new curriculum modules and exhibition evaluation mechanisms for art education resides in the educator's commitment to guiding students in mastering ontology language, diverse artistic perception channels, logical correlation awareness, and creative ability across various artistic expressions, including painting, music, dance, architectural art, poetry, and film and television performances [5].

In organizing and conducting art education activities, teachers should consider the research strengths and characteristics of art colleges in painting practice, painting theory foundations, and other areas. They should employ classic works of Chinese and Western aesthetics as research focal points, comparing and analyzing the divergent models of Chinese and Western civilization's perception of time and space. Learning from each other's strengths and weaknesses, teachers should utilize imageology, formal analysis, visual cognition, art history, and other theoretical thinking dimensions to underpin research directions. Visual evidence, historical culture, literature materials, and other aspects of painting should be utilized to validate and reference each other, extensively employing visual communication, model construction, and multiple perceptual channels to present art forms and vocabulary, thereby forming a comprehensive educational thinking chain and innovating new curriculum modules and exhibition evaluation mechanisms for art education.

Furthermore, the exhibition evaluation mechanism in art education should not be confined to painting and two-dimensional planes but should gradually encompass universal art forms and comprehensive multidimensional thinking, thereby significantly enriching the scope of art education exhibitions. Teachers should concentrate on constructing a dimension of thought regarding the underlying laws and essence of art, devising more creative transformation pathways, and crafting diverse educational scenarios for nurturing high-quality art talents.

Guided by this foundational point and ideological direction, art education should transcend mere dissemination of art theory knowledge and practical skills. It should manifest as art skill training, curriculum education skill summation, and in-depth exploration and analysis of pertinent issues. Firstly, educators should actively explore the foundational mechanisms for the transformation and application of artistic language based on the profound operational laws of art. Secondly, they should delve into internal laws, bridging theoretical findings with reality, and progressively developing forward-thinking discourse expression methods.

With the continuous reform and innovation in the nation's education field, it is anticipated that the scientific advancement of art education, curriculum modules, and exhibition evaluation mechanisms will garner fresh perspectives and diverse practical avenues in the near future.

5. Conclusion

In conclusion, as China's education system undergoes continuous deepening reforms, the significance of art education has progressively become more prominent. Analyzing the new curriculum modules and exhibition evaluation mechanisms in art education holds profound practical significance. The complexity of current art education curriculum modules and exhibition evaluation mechanisms primarily arises from grassroots-level differences stemming from diverse cognitive subjects across various cognitive dimensions. The challenges and intricacies are further compounded by the substantial disparities in the support structures of cognitive subjects for the underlying logical modes of civilization and their discernment abilities.

Therefore, to enhance effectiveness and teaching quality, fostering reform and innovation in art education, educational departments, and institutions at various levels must comprehensively grasp and utilize the new curriculum modules and exhibition evaluation mechanism in art education. This entails innovating teaching models, objectively assessing teaching and student learning outcomes, continuously refining and innovating art education paradigms, and gradually nurturing students to develop comprehensive, three-dimensional, and forward-thinking academic abilities and cognitive frameworks.

Disclosure statement

The author declares no conflict of interest.

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Teaching Practice of Virtual Reality Development Course Based on Coin Collecting Game Project

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Abstract: In response to traditional process-based project-based teaching, each chapter of the course is structured around an independent project. However, this approach lacks coherence in project content, leading to low participation and enthusiasm among students in the classroom. This article combines the characteristics of virtual reality development courses and introduces a novel teaching practice model driven by a gold coin-picking game project. The course content is seamlessly integrated into the practical aspects of the gold coin-picking game project. The course learning process mirrors the virtual reality game development process, effectively engaging students and fostering active learning, resulting in a sense of achievement.

Keywords: Virtual reality; Game project; Teaching practice

Online publication: February 25, 2024

1. Introduction

"The Outline of The 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives Through the Year 2035 of the People's Republic of China " [1], as well as the "Action Plan for the Integration and Development of Virtual Reality and Industry Applications (2022–2026)" [2], both explicitly point out that virtual reality, including augmented reality and mixed reality, is an important frontier in the new generation of information technology, as well as a significant prospective field in the digital economy. The virtual reality technology sector plays a crucial role in the strategic layout of the national digital economy, with the development of virtual reality courses being a key priority. In the teaching practice of virtual reality development courses, it is crucial to consider students' motivation for learning and the cultivation of their ability for independent innovation.

2. Issues in the teaching of virtual reality development courses

2.1. Weak coherence in course content

Virtual reality development courses emphasize practical teaching. However, certain textbooks organize course

content into individual projects based on chapters, resulting in fragmented content lacking coherence between projects. Consequently, students struggle to apply and utilize learned knowledge and skills in practice, leading to a lack of sustained enthusiasm for learning.

2.2. Lack of creativity in project design

Virtual reality projects inherently offer high interactivity and immersive experiences for learners and developers [3]. However, current project-based virtual reality development courses lack creativity and student-centered project design [4]. Instead, the focus remains on teaching individual chapters' knowledge and skills, predominantly led by instructors. This approach fails to effectively engage students and stimulate their enthusiasm and interest in learning. For instance, in the "Fundamentals of Unreal Engine (UE4)" [5], the chapter on the material system primarily covers the creation of metal and concrete materials, which fails to capture students' interest.

3. Teaching practice of virtual reality development course driven by coin collection game project

3.1. Course objectives

Project-driven teaching cultivates students' problem-solving and comprehensive practical abilities through continuous engagement [6]. This course prioritizes students' passion for gaming, centers around their needs, and emphasizes tangible outcomes. It begins by presenting the coin collection game project, which students create upon completing the virtual reality development course, thereby capturing their interest [7]. Subsequently, the coin collection game project is deconstructed into teaching components, including terrain system, material system, blueprint system, animation system, particle system, user interface (UI), and lighting system. Students acquire knowledge and skills through gameplay and project design, ensuring applicability to real-world scenarios and fostering continuous, long-term learning.

3.2. Introduction to coin collection game project

The coin collection game is a third-person perspective game in which players control the character using the "WASD" keys for movement and the spacebar for jumping. The game features a 60-second countdown and 20 preset coins randomly scattered across the scene. Each collected coin awards the player 10 points. To win the game, players must accumulate a total score of 100 within the allotted time. Failing to reach this score results in a loss.

3.3. Breakdown of coin collection game project

In this course, we use the coin collection virtual reality game project as an example and divide it into 7 sub-modules: scene terrain creation, material creation, blueprint creation, particle effects creation, character animation creation, game UI creation, and lighting effects creation.

3.3.1. Scene terrain creation module

Steps for designing the coin collection game scene terrain:

(1) Determine the game theme: Establish the game's theme as adventure-based.

(2) Design a background story: Create an engaging narrative for the game scene to immerse the player in the story.

(3) Define the concept of the game scene: Based on the theme and background story, develop the concept

of the game scene, including level settings, map design, props, and characters.

(4) Create the game map: Use design tools like Unity or Unreal Engine to construct the game map, considering terrain, buildings, and obstacles.

(5) Define interactive elements: Determine interactive elements such as switches and mechanisms to add interest and challenge.

(6) Design game levels: Develop levels with clear objectives and challenges to match the game's difficulty and player progression.

(7) Test and optimize: Conduct testing to ensure smooth gameplay and adjust the scene based on feedback.

(8) Beautify and optimize: Enhance the visual appeal of the scene by adding details and effects.

3.3.2. Material creation module

Steps for creating coin materials:

(1) Gather reference materials: Before starting material creation, gather relevant references, including the appearance, color, and texture of the coins.

(2) Create basic materials: Utilize image editing software like Photoshop or material editing software such as Unreal Engine to develop basic materials. Define the material's appearance using textures, colors, lighting, etc.

(3) Create texture maps: Generate texture maps such as diffuse, normal, and roughness maps by capturing photos, painting, or using computer-generated methods. These maps define the details and surface characteristics of the material.

(4) Determine material properties: Based on the coins' nature and their role in the scene, establish the material's physical properties, such as metalness, smoothness, and transparency, affecting its rendering in the game.

(5) Create material channels: Apply texture maps and other properties to material channels, including the diffuse, normal map, and ambient occlusion channels. These settings dictate the material's appearance under different lighting conditions.

(6) Debug and optimize: Test and optimize the materials by assessing their effects in the game engine. Adjust parameters related to lighting, color, and textures to achieve improved visual results.

(7) Export and apply: Export the created materials in a game engine-supported format and apply them to objects in the game.

3.3.3. Blueprint creation module

Steps for creating the coin collection game blueprint:

(1) Determine the core mechanics and functions of the game: Define the game's essential mechanics and functions, including objectives, gameplay, user interface, and character behavior.

(2) Create a blueprint design document: Begin by drafting a design document to document the game's logic and functions.

(3) Use the blueprint editor: Employ the blueprint editor of the game engine (e.g., Unreal Engine's blueprint editor) to develop the blueprint. This interface enables developers to create and connect logic and functions graphically.

(4) Create blueprint classes and variables: Within the blueprint editor, establish blueprint classes and variables. These classes define object behavior and attributes, while variables store and pass data.

(5) Add blueprint nodes and connections: Utilize blueprint nodes to represent various functionalities and logic. These nodes can trigger events, execute actions, and perform conditional checks. Connect them to define the game's flow and interaction.
(6) Debug and test: Once the blueprint is complete, debug and test it to ensure its logic and functions operate as intended. Game engines typically offer debugging tools and testing environments for identifying and resolving errors.
(7) Integrate into the game: Upon successful testing, integrate the blueprint into the game.

3.3.4. Particle effects creation module

Steps for creating the coin collection game particle effects:

(1) Determine game requirements: Begin by identifying the desired particle effects for the coin collection game, such as using sparkles or beams to indicate coin collection.
(2) Create particle system: Utilize the particle system tools of the game engine (e.g., Unreal Engine's Cascade) to generate particle effects. Customize particle shapes, colors, sizes, etc., and configure emitters and emission rates accordingly.
(3) Design particle effects: Use emitter variations to depict coin appearances, then manipulate particle emission, rotation, scaling, fading, etc. to illustrate coin movement and disappearance.
(4) Add particle textures: Enhance the realism of particle effects by incorporating textures to modify particle appearances. Utilize different textures to represent various coin shapes and colors.
(5) Adjust particle parameters: Fine-tune particle parameters, including emitter position, speed, angle, particle lifespan, size, color, and response to forces and gravity, to achieve desired effects.
(6) Testing and optimization: Conduct thorough testing and optimization to ensure smooth operation and alignment with game requirements.
(7) Integration into the game: Integrate the particle system as a game object for corresponding coins and activate effect playback when the player collects the coins.

3.3.5. Character animation creation module

Steps for creating coin collection game character animation:

(1) Character design: Start by designing and creating the characters for the game. Determine their appearance, shape, size, etc., as well as their basic actions such as standing, walking, jumping, and coin collection.
(2) Animation planning: Before beginning character animation creation, establish an animation plan. Determine the necessary actions and transition animations for the character, along with triggers for these animations (e.g., player input or specific event triggers).
(3) Animation software: Choose appropriate animation software, such as Animator in Unity or Spine software.
(4) Animation skeleton: Based on the character's design, create a basic skeleton or skeletal system. This skeleton serves as the foundation for character animation and allows control and manipulation of various parts of the character.
(5) Keyframe animation: Use the keyframe function in the animation software to create animations for the character's actions, including basic actions like standing and walking, as well as specific actions like jumping and coin collection.
(6) Transition animations: Develop transition animations to smoothly switch between different actions,

such as transitions from standing to walking or from walking to jumping. Utilize the transition function in the software to achieve these effects.

(7) Animation optimization and adjustment: Optimize and adjust the character animations to ensure smoothness and alignment with game requirements.

(8) Integration into the game: Once satisfied with the character animations, integrate them into the game.

3.3.6. Game UI design module

Steps for designing coin collection game UI:

(1) Design interface: Determine the overall style and theme of the game UI, considering colors, images, fonts, and layout for consistency and attractiveness.

(2) Interface elements: Define necessary elements like title bars, buttons, text boxes, and icons, designing their appearance based on game requirements.

(3) Layout design: Develop a logical layout considering functionality and content, ensuring elements are positioned well for user interaction.

(4) Image assets: Create required assets such as backgrounds and icons according to the interface design.

(5) Text and font: Select appropriate fonts and styles for readability and ease of use.

(6) Animation and transition effects: Enhance interface appeal with animations like button clicks and page transitions.

(7) User interaction: Ensure elements are interactive and navigable.

(8) Integration into the game: Once the UI design is finalized, integrate it into the game.

3.3.7. Lighting effect creation module

(1) Steps for creating coin collection game lighting effect:

(2) Set light source position: Determine the optimal position for the light source in the game scene to achieve the desired effects.

(3) Determine light source type: Select the appropriate type of light source – point lights, spotlights, or directional lights – based on game requirements.

(4) Set light source properties: Adjust properties such as intensity, radius, and color to fine-tune the lighting effect.

(5) Render the scene: Utilize the rendering functionality of the game engine or graphics library to apply the lighting effect to objects in the scene.

(6) Adjust lighting effect: Experiment with different light source positions, properties, and scene layouts to achieve desired lighting aesthetics.

(7) Lighting special effects: Enhance the lighting effects with additional effects such as shadows, halos, and glare to increase virtual realism.

(8) Testing and debugging: Evaluate the performance of the lighting effect in the game and make necessary adjustments for optimal results.

4. Conclusion

By analyzing the issues in teaching virtual reality development courses and embracing students' interests, a new practical teaching model for these courses is proposed, centered around the virtual reality coin collection game project. This model integrates the development and design process of the coin collection game into the course curriculum, thereby enhancing students' engagement and fostering their engineering project thinking. This

integration facilitates the mutual enhancement of knowledge transmission and value dissemination.

Through the implementation of teaching reforms in virtual reality development courses, students' enthusiasm for learning has been revitalized, fostering an environment of independent learning and active exploration. Consequently, this has significantly enhanced the teaching quality and students' academic achievements.

Disclosure statement

The authors declare no conflict of interest.

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Educator's Spirit is the Primary Orientation of the Construction of a High-Quality Teacher-Team in the New Era

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Abstract: The educator's spirit is the professional ethos that must be cultivated in the process of shaping the new generation of teachers. It serves as the foundational pillar for the growth and development of educators, aligning with the essential prerequisites of a robust educational landscape in the modern era. The spirit of the educator is the primary guiding force behind the cultivation of high-quality teachers in the new era. By elucidating the connotations and essence of the educator's spirit, it becomes evident that integrating it into teacher development holds unique value. This integration contributes to the advancement of teachers' morality and ethical frameworks, ensuring effective education delivery that meets public satisfaction and strengthens the nation's educational strategy. The integration of the educator's spirit into teacher development is a practical imperative for educators in the new era. It clarifies their value orientation, equips them to navigate risks and challenges, and reconnects them with the true essence of education. Furthermore, incorporating the educator's spirit into the standardization, cultivation, and institutional frameworks presents a tangible pathway to enhancing the high-quality evolution of teacher development in the new era.

Keywords: Educator's spirit; High quality; Teaching force; Teacher development

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1. Introduction

The spirit of the educator embodies the educational responsibility of teachers in the new era, grounded in the present while aiming toward the future. It also represents the imperative of the times for the high-quality advancement of education [1]. As students are the cornerstone of the country's future development, teachers assume a pivotal role in shaping that future. The educator's spirit is intricately linked to the fundamental questions of "whom to train, how to train, and for whom to train," forming a foundational requirement for the high-quality development of the teaching workforce [2].

1.1. The value of integrating the spirit of educators into the construction of the teaching force in the current era

1.1.1. As the essence of teacher-team building, it helps promote the construction of teachers' morality and ethics

Virtue stands as a core concept in traditional Chinese culture, emphasizing the cultivation of personal character and moral integrity. The spirit of educators represents a novel concept and a fresh requirement that amalgamates Marxist educational ideology with the pressing demands for the high-quality development of teacher-team construction in contemporary circumstances. It serves as a clear indicator of the primary objective in teacher-team building: the establishment of a moral foundation. To effectively seize the leading position in the high-quality evolution of teacher training and to establish distinctive advantages in China's emphasis on teacher morality within teacher training, educators imbued with this spirit can genuinely embody the value orientation of prioritizing morality.

On one hand, prioritizing virtue forms the spiritual bedrock for the high-quality progression of teacher-team construction. It underscores the perpetual pursuit of heightened moral refinement, professional conduct, and pedagogical standards throughout the process of teacher-team development. This emphasis influences and guides students toward healthy growth, instilling noble ideals and a profound sense of purpose, thereby accentuating the essence of "people-centeredness and service to the people" within teacher-team construction.

On the other hand, amidst the swiftly evolving international landscape, the construction of the teaching force is significantly influenced. Teacher-team construction in the new era cannot merely replicate the wisdom of ancient sages in Chinese history nor blindly adopt the practices of foreign nations; such an approach would fail to align with China's current developmental stage in education. Hence, the spirit of educators can nurture and transmit exceptional traditional culture and national ethos. It must be steadfastly integrated into the cultivation of teachers' morality and ethics, embodying Chinese characteristics and rooting itself in the interests of the populace, the trajectory of societal progress, and the educational requisites. This ensures that the spirit of educators finds solid footing within China's teacher-team construction efforts [3].

1.1.2. As a source of motivation for the construction of the teaching force, it helps ensure good education to satisfy the people

Teachers, as the cornerstone of education, serve not only as facilitators of instructional tasks but also as guides and mentors for the growth of students, bearing the responsibility of nurturing future leaders. Consequently, the establishment of a high-quality teaching force holds immense significance for the advancement of education and the prosperity of the nation. The spirit of the educator serves as an intrinsic force driving the delivery of satisfactory education to the populace, constituting a core catalyst that propels the teaching force to continuously elevate their professional standards and pursue advancement, while also instilling teachers with the requisite enthusiasm and resilience for the cause of education.

On one hand, the educator's spirit can foster cohesion and unity within the teaching force, cultivating a supportive environment characterized by solidarity and mutual assistance. Leaders of the Party and the State have consistently stressed that robust education hinges on the empowerment of teachers, emphasizing that the construction of the teaching force constitutes the paramount foundational endeavor in building a strong education-oriented nation. The elevation of this task from "foundational work" to "the most crucial foundational work" underscores the pivotal role of teaching force construction in fostering a robust educational landscape. Teachers must collaborate and support one another in fulfilling their educational mandates. The spirit of the educator empowers teachers to inspire, exchange work experiences, and share educational insights, fostering a collaborative dynamic that not only enhances the overall quality and competence of the teaching force but also

propels the wholesome progression of education.

On the other hand, the spirit of the educator can ignite innovative thinking and entrepreneurial spirit within the teaching force. In a rapidly evolving social milieu, education endeavors must contend with constant new challenges, necessitating continuous learning and innovation on the part of teachers. The spirit of the educator invigorates the teaching force with a sense of purpose, fostering a culture of self-directed learning and improvement. Through continuous learning and practical application, teachers are spurred to explore new educational paradigms and methodologies, thereby catalyzing innovation and reform within the educational sphere [4].

1.1.3. As an intrinsic requirement for the construction of the teaching force, it helps consolidate the strategy of strengthening the country through education

Education stands as a pivotal determinant in the ascent or descent of a nation, and the development of a robust educational system is integral to a nation's enduring strength through comprehensive advancement in the realm of education. Thus, it is imperative to fully acknowledge the strategic significance and role of fostering a robust education-oriented nation in national progress. With the unveiling of the "Higher Education Power Index," China has assumed a leading position globally, showcasing remarkable advancement and affirming the efficacy of the socialist education model tailored to Chinese characteristics.

On one hand, human capital represents the foremost asset for national strength. By fortifying the construction of the teaching force, the spirit of the educator can bolster the high-quality evolution of the teaching cadre, nurturing a sense of value realization among educators. It empowers teachers to engage in rigorous research and reflective practices concerning prevailing educational models and methodologies, ultimately cultivating individuals endowed with professional proficiency and innovative prowess. This encourages educators to prioritize educational equity, address the educational needs of marginalized groups, advocate for the equitable allocation and distribution of educational resources, and uphold the principle of meritocracy in talent cultivation.

On the other hand, grounded in scientific and progressive educational principles, the educator's spirit steers the trajectory of educational development, effectively underpinning educational reform and innovation. It facilitates the cultivation of teachers who are steadfast in upholding and perpetuating the rich traditions of Chinese culture, thereby fortifying the foundation of a robust educational nation. Furthermore, it emboldens educators to embark on exploratory endeavors, spearhead innovation, and achieve breakthroughs. This entails a commitment to continuous learning and self-improvement, championing lifelong learning initiatives, monitoring the influence of scientific and technological advancements and societal shifts on education, and actively advocating for the seamless integration of education with industry and society [5].

2. The educator's spirit in the new era: addressing the realities of teaching force construction

2.1. Clarifying the starting point of value orientation

In the midst of a complex and ever-evolving international landscape, the introduction of diverse value orientations can precipitate conflicts, impede educational progress, and even engender social unrest. Education, being a noble and intricate pursuit, not only shapes the growth and prospects of students but also underpins the advancement and prosperity of society.

First and foremost, educators themselves grapple with myriad value choices and pedagogical approaches. To instill in the younger generation a correct understanding of the interplay between the world, the nation,

and the individual, and to delineate the path of correct value alignment, educators must first ascertain their own value orientations. This constitutes a pivotal task that demands precedence in the realm of teaching force construction, with its core essence residing in educators who embody the spirit of the educator.

Secondly, value orientation transcends mere indoctrination or conscious blocking; rather, it involves the embodiment and enactment of the educator's spirit. Educators create an open, inclusive, and pluralistic learning environment, characterized by objectivity and comprehensiveness. Here, they guide students to comprehend, respect, and appreciate diverse value systems, aiding them in discerning and evaluating the underlying principles and influences. This cultivates a broadened global perspective, heightens multicultural awareness, and safeguards against the perils of singular-value indoctrination, enabling students to navigate the complexities of reality by striking a balance among competing values.

Lastly, education extends beyond the transmission of knowledge; it encompasses the cultivation of values and the development of personality. The spirit of the educator facilitates the holistic development of educators, fostering empathy and respect for others, society, and the environment. Through various practical activities, educators grasp societal issues and needs, championing correct value orientation and seamlessly aligning personal aspirations with national development imperatives [6].

2.2. The ability to cope with risks and challenges

The field of education remains in a perpetual state of flux and evolution, often accompanied by risks and challenges. In an educational milieu fraught with such uncertainties, the spirit of the educator enhances teachers' capacity to navigate these obstacles, enabling them to better cater to students' needs, foster the high-quality advancement of education, and contribute to societal progress.

Firstly, in confronting these risky challenges, the educator's spirit demands that teachers exhibit the courage to transcend traditional models and paradigms. They are encouraged to explore novel educational methodologies, techniques, and strategies, continuously refining their teaching philosophy and pedagogical approaches. By fostering a culture of continuous innovation and adaptation, educators can devise more effective educational solutions, remaining agile in response to shifts in the educational landscape.

Secondly, risk challenges may engender complex and multifaceted educational contexts and dilemmas. Here, the educator's spirit augments teachers' adaptability and fosters an inclusive mindset. Educators are urged to proactively explore and implement personalized educational approaches, viewing risk challenges through a multifaceted lens. By fostering open communication and understanding, educators can create an inclusive learning environment, guiding students to respect and comprehend one another's perspectives, while offering tailored support and guidance to unlock students' full potential and achieve their individual goals.

Lastly, risk challenges often precipitate crises and pressures that exacerbate societal inequalities and educational disparities. The educator's spirit equips teachers with the resilience to manage and navigate crises, fostering a calm and composed response to emergent situations. Teachers are empowered to advocate for the equitable distribution of educational resources, safeguarding the rights and interests of both education and marginalized groups. By assuming the mantle of educational equity and social responsibility, educators contribute to the sustainable development of both education and society, thus championing societal progress and advancement [7].

2.3. Tracing the true meaning of education back to the family's original heart

The spirit of the educator embodies a noble quality and professional ethos upheld throughout the process of teacher-team cultivation. As stewards of education, teachers bear the weighty responsibility of nurturing talent

and transmitting civilization, with the educator's spirit underscoring the imperative for teachers to imbue their educational endeavors with a profound sense of purpose. This fosters a return to the essence of education, compelling teachers to hold themselves to a higher standard in order to effectively fulfill the educational mission.

Firstly, teachers must not only bolster their professional development but also devote attention to cultivating their own character, thought processes, and innovative capacities. By igniting their passion and dedication toward the cause of education, educators are urged to embrace and accommodate the individual differences among students, enabling them to authentically embody their roles and enrich the educational experience.

Secondly, the spirit of the educator underscores the importance of teachers engaging in introspection and continuous professional growth. By perpetually assessing their educational practices and outcomes, educators are encouraged to prioritize their holistic personal development. Fostering an environment of collaboration and interaction within the teacher-team building process, educators enhance their educational prowess, ultimately providing superior educational services and embodying the essence of education.

Lastly, the educator's spirit engenders a broader perspective, emphasizing that teacher-team construction should prioritize the cultivation of teachers' sense of social responsibility and civic consciousness. Guiding teachers to actively engage with societal realities and challenges, educators are prompted to participate in social advocacy and voluntary service initiatives. This realization empowers educators to perceive themselves as catalysts for societal progress, integrating theory with practice and leading by example to establish upright values and social morality. By making positive contributions to the enhancement of education quality and social development, educators embody the true essence of education [8].

3. The practical path of integrating the educator's spirit into the teacher-team building in the new era

3.1. Integrating the spirit of the educator into the standard system of teacher-team building

Incorporating the spirit of the educator into the standard system of teacher-team building holds the potential to enhance the quality and competence level of educators, thereby laying a robust foundation for educational advancement. A standard system infused with the essence of the educator's spirit can yield outstanding educators distinguished by noble qualities, a profound sense of responsibility, and a commitment to social welfare. Simultaneously, educators will develop a deeper understanding and resonance with the core objectives and values inherent in the educator's spirit, thereby contributing to the sustainable progression of the educational enterprise.

Firstly, prioritizing teacher education emerges as a pivotal avenue for fortifying the teaching force. By intensifying the cultivation of the educator's spirit among prospective teachers, tailored training programs, curriculum content, and instructional methodologies can be devised, aligning with the fundamental knowledge, values, and competency requisites of the educator's spirit. This equips aspiring educators with the foundational elements necessary to embody the essence of educators.

Secondly, the refinement of professional development standards for educators warrants continual enhancement, with close integration of the educator's spirit. By articulating the core value of the educator's spirit within the framework of professional standards, and delineating the requisite knowledge, skills, abilities, and qualities across various career stages, educators are guided to prioritize the foundational qualities and spiritual attributes intrinsic to educators throughout their professional development journey.

Lastly, the design and implementation of educator's spirit courses tailored to educators of diverse

backgrounds and expertise levels are imperative. These courses should encompass the ideologies and attributes emblematic of educators, principles of professional conduct and management, as well as effective pedagogical approaches. Through systematically structured courses, educators gain a nuanced understanding and mastery of the essence and practical methodologies associated with the educator's spirit [9].

3.2. Integrating the educator's spirit into the training system of teacher-team building

The integration of the educator's spirit into the training system of teacher-team building assumes a pivotal role in fostering a profound educational ethos, stimulating pedagogical innovation and reform, and nurturing holistic student development. This integration is intrinsically linked to steering and advancing the trajectory of teacher-team construction, elevating the overall caliber of the teaching cohort, and enhancing educational quality, thereby empowering educators to authentically embody the essence of education and propel the continuous advancement of China's educational endeavors.

Firstly, a robust emphasis must be placed on bolstering theoretical comprehension of the educator's spirit. Through the dissemination of knowledge pertaining to the educator's spirit, educators can cultivate a deeper understanding and appreciation of its essence and value, thereby igniting their fervor and dedication to assuming the role of educators. Furthermore, by immersing themselves in the works of eminent educators and relevant scholarly literature, educators can glean profound insights into the ideologies and attributes emblematic of educators, enriching their own educational acumen.

Secondly, emphasis should be placed on cultivating the practical aptitude inherent in the educator's spirit. Beyond theoretical comprehension, the educator's spirit embodies a practical skill set encompassing exemplary leadership, innovation prowess, organizational acumen, and effective management capabilities. Through experiential learning modalities such as classroom teaching, case studies, and practical exercises, educators can hone these competencies, gradually embodying the demeanor and disposition of exemplary educators.

Lastly, a concerted effort must be made to fortify practical experiential learning. To cultivate a cadre of adept educators, practical exposure to the nuances of the educator's spirit is imperative. Through immersive activities such as school visits, exchange programs, and practical coursework, educators gain invaluable insights into the realities of educators' work, honing their practical skill sets. This immersive approach enables educators to effectively implement the tenets of the educator's spirit, fostering a profound understanding and experiential proficiency in educators' work [10].

3.3. Integrating the spirit of the educator into the institutional system of teacher-team building

The cultivation and maturation of the educator's spirit extend beyond the actions of individual educators or groups; it encompasses the institutional environment and the array of systems governing teacher-team development. The integration of the educator's spirit into the institutional system of teacher-team building necessitates collaborative efforts across various fronts, including policy formulation, the establishment of evaluation mechanisms, and educational institution management.

Firstly, it is imperative to underscore the significance and imperative of the educator's spirit in the evolution of the teaching profession. Policies and regulations can be actualized through legislation, regulatory frameworks, and guiding directives. It is paramount to solicit input from education experts, scholars, and teachers' representatives to ensure the scientific rigor and practicability of these systems.

Secondly, establishing an evaluation mechanism for the educator's spirit is crucial. This entails delineating the requisite attributes and specific manifestations of the educator's spirit and integrating them as pivotal criteria for assessing the quality and caliber of teacher-team construction. Incorporating the educator's spirit into

teacher title evaluations, performance assessments, and promotion criteria incentivizes educators to espouse and embody the educator's spirit in their professional endeavors, fostering a conducive atmosphere for education and pedagogy.

Thirdly, bolstering the management of educational institutions is imperative. Across all levels of educational establishments, a robust education management framework must be established, elucidating the responsibilities and prerogatives of educational institutions while enhancing oversight mechanisms.

Lastly, prioritizing the cultivation of educators within educational institutions is paramount. Enhancing the quality of educator recruitment, appointment, and training processes serves to comprehensively propagate the educator's spirit, thereby fostering a favorable educational ecosystem conducive to its flourishing.

4. Conclusion

In conclusion, the spirit of the educator stands as a crucial pillar and cornerstone in the endeavor to construct high-quality teachers in the new era, serving as a wellspring of inspiration for educators to incessantly strive for excellence in their educational pursuits. As the linchpins of society, educators shoulder the vital responsibility of nurturing future talents and perpetuating the wisdom of civilization. Embodied within the educator's spirit are noble ideals and lofty aspirations, wielding profound significance in fortifying their professionalism and elevating the educational landscape [11].

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Exploration and Innovation in Medical Education Reform by Integrating Online and Offline Models

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Abstract: The fifth collective study session of the Political Bureau of the CPC Central Committee emphasized the importance of educational digitalization as a significant breakthrough for the country, enabling the opening of new opportunities for educational development and the creation of new advantages in this field. This article closely examines the challenges confronting traditional medical teaching against the backdrop of national policy. It delves into the integration of ideological and political education, the establishment of a medical teaching model combining both online and offline modes, the innovation of teaching resources and methods, and the enhancement of the job competency of medical school teachers. Furthermore, specific measures for the reform of medical teaching through the integration of online and offline models are proposed to achieve a collaborative education focusing on "knowledge, ability, and moral education."

Keywords: Online and offline integration; Medical teaching reform; Collaborative education

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1. Introduction

The "National Medium and Long-term Education Reform and Development Plan (2010–2020)" emphasizes the revolutionary impact of information technology on education and underscores the need for serious consideration. In March 2021, the Ministry of Education issued a "Notice on Strengthening the Informatization of Education Management in the New Era," advocating the use of data as a driving force and leveraging the new generation of information technology to elevate the digital, networked, and intelligent aspects of education management. In November of the same year, the Central Committee of the Communist Party of China and the State Council issued major strategic directives to promote the development of "Internet+ Education," heralding China's march toward the digital transformation of its education sector. Utilizing information technology to support the high-quality development of education aligns with the general trend, developmental needs, and direction of teaching reform.

Against the backdrop of building a healthy China, the provision of high-quality and personalized medical services necessitates the cultivation of high-quality medical human resources. Medical teaching, as the primary source of medical and health professionals, profoundly influences the training process and quality of these

talents, presenting both new opportunities and challenges. Presently, China's smart education infrastructure and equipment environment are well established. The proliferation of Massive Open Online Courses (MOOCs) in colleges and universities has surpassed 64,500, with student enrollment exceeding 1.088 billion, ranking China at the forefront globally in terms of construction and application scales. The digitalization of education has widened the access to high-quality educational resources. The advent of online teaching platforms such as MOOCs, virtual simulations, and Xuedutong has revolutionized traditional medical teaching methods, significantly enhancing the quality of medical theory courses.

However, traditional medical experimental teaching struggles to meet the practical, cutting-edge, and innovative demands of modern medicine due to constraints such as limited teaching resources and insufficient class hours. Effectively capturing the rules and directions of medical talent training and continually optimizing the training model based on the trend of online and offline integration to better align with societal needs has become a pivotal area of exploration in current medical teaching reform.

2. Problems faced by traditional medicine teaching

2.1. Theory and practice disconnect

In the traditional medical teaching model, theory often takes precedence over practice. Throughout the teaching process, there is a relentless emphasis on imparting professional theoretical knowledge, followed by confirmatory experiments. Students proceed through the experimental process systematically, verifying the correctness of experimental conclusions. Regrettably, the innovative and practical thinking abilities of students are neglected; they struggle to think independently, hindering the application of theoretical knowledge in practical scenarios. Moreover, newly hired teachers lacking clinical knowledge and experience resort to mechanical explanations of textbook content, offering limited insights into clinical cases and other crucial aspects. Consequently, students face a profound disparity between theoretical knowledge and practical application [1], resulting in difficulties integrating theory with real-world problems. This impedes their ability to handle emergencies, transition smoothly into the profession, and adapt to the evolving landscape of modern medicine [2].

2.2. Dominance of "teaching" over "learning"

Medicine is an important discipline that demands rigor and thoughtfulness from students. However, its traditional teaching approach emphasizes "teaching" as the primary focus, relegating "learning" to a secondary role. In medical theory courses, lecturing predominates, supplemented by various teaching methods such as case-based and heuristic approaches, aiming for interactive classroom environments. Conversely, practice courses typically follow a single-experiment teaching model, wherein teachers explain theoretical principles via presentations, followed by hands-on activities and student-led reporting [3]. This teacher-centric approach restricts students' autonomy and fosters a passive "cramming" mentality, hindering their ability to digest complex subject matter [4]. Students often struggle to internalize knowledge and apply it effectively in clinical settings, lacking innovative and clinical thinking skills. Moreover, reliance on traditional teaching environments limits students' exposure to modern information technology and reduces opportunities for self-study, ultimately dampening their enthusiasm and initiative in learning [5].

3. Background of the medical teaching reform of the online and offline integration model

The online and offline integration teaching model employs the seamless fusion of online teaching platforms,

resources, and offline teaching methods to foster independent learning among students. In recent years, China has implemented policies to promote both online and offline teaching, offering valuable guidance for the reform of medical education. **Table 1** provides a summary of specific policies for online and offline teaching spanning from 2018 to 2023.

Table 1. Summary of some policies for online and offline teaching (2018–2023)

Time	Policies/Notices	Published by	Content
September 2018	"Opinions of the Ministry of Education on Accelerating the Construction of High-level Undergraduate Education and Comprehensively Improving Talent Training Capabilities"	Ministry of Education	Focusing on student development, build a teaching model that combines online and offline activities to promote the revolution in classroom teaching [6].
September 2019	"Guiding Opinions on Promoting the Healthy Development of Online Education"	Eleven departments, including the Ministry of Education	Accelerate the in-depth integration of science and technology and education, promote the positive interaction between online education and offline education, the organic connection between on-campus education and off-campus education, cultivate new forms of educational services, and comprehensively enhance the ability of education to serve economic and social development [7].
November 2019	Notice of the General Office of the Ministry of Education on carrying out the recognition of offline, online and offline hybrid, and social practice national first-class undergraduate courses in 2019"	General Office of the Ministry of Education	Conduct application and recommendation work for national-level offline first-class courses, national-level online and offline hybrid first-class courses, and national-level social practice first-class courses.
March 2021	"Notice of the Ministry of Education on Strengthening the Informatization of Education Management in the New Era"	Ministry of Education	With data as the driving force, use the new generation of information technology to enhance the digital, networked, and intelligent level of education management [8].
February 2022	"Key Points of the Ministry of Education's Work in 2022"	Ministry of Education	Implement educational digitalization strategic actions. Strengthen demand traction, deepen integration, innovation empowerment, and application drive, actively develop "Internet+ education," and accelerate education's digital transformation and intelligent upgrading [9].
March 2023	"Key Points of Work of the Higher Education Department of the Ministry of Education in 2023"	Ministry of Education	Accelerate the digital transformation of higher education and create a new form of teaching.

In August 2019, Wu Yan, then-director of the Department of Higher Education at the Ministry of Education, emphasized the imperative to "truly enhance the quality of medical education," with the objective of establishing top-tier medical courses [10]. Subsequently, *in October 2022,* the report of the 20th National Congress of the Communist Party of China underscored the need to "advance the digitalization of education and construct a learning society and nation, fostering lifelong learning for all individuals" [11].

In August 2023, the successful convening of the Medical Education Forum further emphasized "digital empowerment to drive the high-quality development of medical education." The forum extensively shared experiences in digital education and teaching, covering classroom-level digitalization, curriculum development, teaching and research practices, practical teaching methodologies, and evaluation techniques. These initiatives

have clarified the direction and significance of online and offline teaching within the current landscape of higher education, accelerating the pace of exploration and innovation in medical teaching reform.

4. The necessity of medical teaching reform with an online and offline integration model

The integration of online and offline teaching models has emerged as an inevitable trend in medical teaching reform, propelled by the rapid advancement of information technology and the digital economy. Compared to traditional medical teaching, the online and offline medical teaching model offers numerous advantages and enhanced operability. Medical courses, known for their complexity and demanding professionalism, often suffer from limited class hours, leading students to rely heavily on classroom materials and encounter a superficial understanding of theoretical knowledge. By integrating online and offline medical teaching, students can transcend the constraints of time and space, address gaps in learning more flexibly and effectively, personalize their learning experiences, and achieve the principle of "teaching students according to their aptitude" [12,13].

Given the practical nature and abstract, logically intricate content of medical courses, instructors can leverage online and offline integrated teaching to facilitate better comprehension of theoretical knowledge among students. This approach diversifies learning channels, allowing students to swiftly grasp theoretical concepts while honing their clinical skills and fostering innovation capabilities. Particularly pertinent in today's educational landscape dominated by post-2000s students, some of whom may find rigorous medical courses daunting and may be inclined to give up, integrated teaching bridges this gap by harnessing students' affinity for online resources and seamlessly blending classroom instruction with Internet-based learning. This method not only enhances teaching efficiency by promoting teacher-student interaction but also cultivates students' independent thinking and analytical skills [14], igniting their enthusiasm for learning and instilling a sense of ownership over their education [15].

Traditionally, medical education heavily relied on teachers for knowledge dissemination. However, given teachers' constraints in terms of resources and time for lesson preparation and post-class activities, integrating online and offline teaching methods enables mutual benefit between students and teachers. Students gain access to diverse medical knowledge sources beyond their instructors, including online platforms and websites. Meanwhile, teachers can devote more time and resources to enriching teaching content and honing educational skills. They can also augment their knowledge and expertise through online platforms and hands-on clinical experience, fostering a comprehensive learning experience for students and enhancing teachers' educational competencies [16].

In recent years, the confluence of national policy support and the efficacy of hybrid teaching models has spurred increased research on online and offline medical teaching. A study analyzing research trends in medical education in China from January 2012 to June 2022 revealed a growing focus on teaching reform, flipped classrooms, and online and offline teaching models, among other topics. While teaching reform has historically been a prominent area of research, the emergence of online and offline teaching research since 2017 underscores its rising significance [17]. However, current approaches to medical teaching, both online and offline, tend to remain fragmented, with a lack of seamless integration between different teaching modalities [18]. Therefore, it is imperative to explore and innovate China's medical teaching reform comprehensively, encompassing teaching methods, online education platforms, and teaching outcomes, within the framework of the online and offline integration model.

5. Measures for medical teaching reform using online and offline integration models

5.1. Integrate ideological and political education and actively practice "curriculum ideological and political education"

Modern medicine necessitates a robust foundation in professional medical theory, technical skills, and a profound understanding of medical ethics, professional ethics, and social responsibility. Regrettably, many medical students prioritize their professional coursework and lack practical knowledge on crucial issues such as doctor-patient trust and dispute resolution. Systematic ideological, political, and legal education is often overlooked, resulting in a weak awareness of humanistic care among patients. To tackle this challenge, medical teaching must prioritize the cultivation of individuals with moral integrity and implement "ideological and political courses" that delve deeply into the ideological and political education elements inherent in medical curricula. Moreover, education should be student-centric, output-driven, and focused on continuous improvement, value creation, knowledge dissemination, and skill cultivation. The medical theory teaching segment should incorporate medical student innovation and entrepreneurship, curriculum ideological and political education elements, and comprehensive and purposeful experiments in medical practice teaching. This holistic approach effectively cultivates medical students' professional ethics, social responsibility, clinical competence, and innovative thinking, thereby stimulating their inner potential and learning motivation.

5.2. Build a medical teaching model that integrates online and offline components

Drawing on the research of Wang *et al.* [19], and based on the perspectives of teacher activities, student activities, and teaching environment, this paper proposes a three-stage model encompassing knowledge acquisition before online classes, knowledge application during offline classes, and knowledge construction after online classes. This model establishes a system that facilitates independent learning and integrates online and offline processes throughout the teaching journey. It includes diagnostic testing, communication and discussion, question answering, multiple teaching methodologies, summary evaluation, reflective learning, consolidation, and expansion [19]. Leveraging online platforms such as "Rain Classroom" and "Xuetang Cloud" enables synchronous interaction between online and offline medical teaching, facilitating the development of an "online + offline" integrated medical teaching model that operates before, during, and after class.

Firstly, prior to each class, essential knowledge, key concepts, pre-class previews, and related ideological and political elements are disseminated on platforms like "Xuetang Cloud," empowering teachers to gauge and adapt to students' learning progress in real-time. Secondly, interactive tools such as barrage, voting, and discussion on platforms like "Rain Classroom" enrich in-class participation, fostering effective teacher-student interaction. Lastly, post-class activities on platforms such as "Xuetang Cloud" offer homework assignments, reviews, and high-level course resources, enabling students to broaden their learning horizons and deepen their understanding of medical concepts.

5.3. Adhere to the principle of "consistency" and innovate teaching resources and methods

The medical teaching reform within the online and offline integrated model must adhere to the "consistency" principle while striving for **high-level, innovative, and challenging education**. On one hand, the goals of medical theoretical and practical teaching should encompass the organic integration of knowledge, abilities, and qualities, leveraging opportunities in digital transformation to nurture advanced problem-solving skills and comprehensive abilities among medical students. On the other hand, teaching resources for medical courses, whether online or offline, must be forward-looking, scientifically grounded, and practically applicable. These resources should be regularly updated in line with cutting-edge subject trends and the evolving needs of modern

medicine and society. Moreover, emphasis should be placed on fostering students' awareness of innovation and entrepreneurship. Digital course teaching resources such as syllabi, lesson plans, courseware, micro-courses, MOOCs, experimental cases, exercise question banks, test question banks, and course summaries should be innovatively developed and made available on platforms such as "Xuetang Cloud," "Xuetang Online," and the "National Smart Education Higher Education" platforms. This ensures efficient integration with offline classroom teaching. Additionally, teaching methods for medical courses should be advanced and interactive, promoting the seamless integration of modern information technology and medical education. Case studies, lectures, demonstrations, interactive sessions, discussions, questioning, and practical exercises, both online and offline, should be employed to facilitate heuristic and guided teaching. The use of multimedia, Internet resources, physical teaching aids, "Rain Classroom," "Xuetang Cloud," and other integrated teaching tools can enhance teaching diversity, striking a balance between dynamic and static learning experiences.

5.4. Improve the competency of medical school teachers

Medical education demands a blend of scientific knowledge and practical skills, yet traditional classroom-based teaching often falls short in providing adequate resources and theoretical instruction time. Consequently, students may lack innovative thinking abilities and may not be fully equipped for societal roles. To address this challenge, enhancing the competency of medical teachers, who serve as the pillars of medical education [20], is paramount. This can be achieved by reinforcing professional awareness among medical school teachers, instilling ethical values, a sense of responsibility, and a commitment to lifelong learning. The teaching concept of online and offline integration can be promoted among medical school teachers through the interpretation of national policies and evaluations conducted by school supervisors, peers, and students. Strengthening teachers' knowledge and information capabilities can involve training them in new technologies and providing them with updated knowledge in basic medical theory, teaching experience, medical skills, and academic proficiency in the medical field. To enhance teaching quality, emphasis should be placed on developing online teaching resources, utilizing online teaching platforms, offering personalized and differentiated learning guidance, and integrating online teacher-student interaction. Various teaching evaluation methods should be employed, and curriculum optimization based on online and offline data should be regularly reviewed. Activities such as viewing and learning sessions, teaching competitions, and teacher assessments can be organized to enhance the teaching ability of medical school teachers and promote the advancement of online and offline integrated medical education.

Disclosure statement

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Teacher Competence, Classroom Management, and Effectiveness in Applied Universities in Henan: Basis for the Teaching Improvement Program

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Abstract: To improve the teaching quality of local application-oriented undergraduate colleges and universities, this study conducted a survey of teachers in three application-oriented demonstration colleges and universities in Henan Province, and assessed the recognition degree of teachers with different personal backgrounds on the three variable dimensions of teacher competence, classroom management, and teaching effect. The results showed that gender and teaching experience have significant differences in teaching ability, personal attitude, and teaching preparation. Education level has a significant influence on teachers' competence, teacher-student communication, and teaching effect. There was no significant difference in age among the three variables. In addition, there is a significant correlation between the three variables, indicating that the stronger the teacher's ability, the better the classroom management, and the higher the teaching effect. This provides a reliable empirical basis for the teaching improvement plan of applied local colleges and universities.

Keywords: Teacher competence; Classroom management; Effectiveness; Applied universities; Teaching improvement program

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1. Introduction

The quality of undergraduate education in the United States declined sharply in the 1990s. To solve the contradiction between teaching and scientific research, the field of higher education in the United States has conducted extensive theoretical and practical research on teaching and scholarship. It has also organized a series of conferences and research projects on teaching and scholarship, which have had a significant academic influence worldwide. This effort has greatly promoted the exchange and sharing of teaching practices in colleges and universities and has changed the phenomenon of contempt for teaching in American universities. Consequently, the problem of declining quality in undergraduate education has been addressed. In the practice of undergraduate education and teaching research promoted by developed countries, all discussions and actions revolve around the concept of effective

teaching, advocating the importance of students' learning development and outcomes. These practical outcomes of undergraduate education have successfully helped these countries enhance their human capital [1].

With the rapid expansion of China's higher education system, many challenges in terms of quality and efficiency have emerged. For instance, due to limitations in teaching resources and inadequate teaching facilities, universities often face issues such as large class sizes and a predominance of collective teaching over small group or individual instruction. Moreover, classroom management is often lacking due to the sheer volume of classes, and there tends to be an imbalance between theoretical learning and practical experience. Teachers often emphasize rote memorization over innovative application of knowledge [2].

To address the quality constraints on personnel training amid China's rapid higher education expansion and to draw lessons from developed countries, the Chinese Ministry of Education issued the "Project of Undergraduate Teaching Quality and Teaching Reform in Institutions of Higher Learning" in 2014. This initiative aims to: (1) promote reform and innovation in teaching content, methods, teams, management, and teaching modes in colleges and universities; and (2) foster students' interest and ability for independent innovation.

Currently, international research on teachers' teaching quality focuses primarily on two aspects: individual-level capabilities and specific teaching behaviors during activities. Most studies employ empirical methods and rigorous data analysis to identify and summarize teachers' abilities and behaviors closely associated with teaching. These studies propose strategies to enhance teaching effectiveness [3]. While these research findings on teacher ability and behavior provide valuable insights under Western teaching paradigms, they may not fully align with the local teaching context in China. Thus, it is essential to integrate these theories with local practices.

This study, based on the teaching context in Henan Province, employs empirical research methods with the goal of improving teaching. By focusing on fundamental teacher abilities, teacher-student interactions, classroom management, and teaching effectiveness, this paper aims to construct a model of teacher abilities, qualities, and classroom management tailored to local conditions. Through examination of teacher personal development, daily teaching practices, and psychological and cultural factors, this paper proposes appropriate measures to enhance teaching effectiveness. Moreover, it provides guidance for local university management departments in policy formulation and teacher training.

2. Objectives

This study comprehensively analyzed the teacher competence, classroom management, and teaching effectiveness of applied universities in Henan Province. Specifically, it described the profile of university teachers in terms of gender, age, teaching experience, and educational attainment. It aimed to determine teacher competence in teaching, scientific research, and cultivating students' abilities and personal attitudes. Additionally, it assessed classroom management in terms of discipline, teaching and learning, and interpersonal communication between teachers and students. Furthermore, it examined teaching effectiveness concerning teaching preparation, teaching materials, teaching methods, teaching attitude, professional development, and coordination of teaching administration. Finally, it tested for significant differences among response profiles and assessed the significant relationships between the three variables. Ultimately, it proposed a teaching development program for teachers to enhance teaching effectiveness.

3. Methods

3.1. Research design

This study primarily employed quantitative research methods, including literature review and survey research.

Leveraging the convenience and speed of library resources and the Internet, the author extensively gathered and reviewed domestic and foreign literature on classroom teaching. This literature provided a robust theoretical foundation and academic support for the study. Classroom teaching data were primarily collected through the distribution of questionnaires. Mathematical models and statistical software were utilized to objectively describe the factors influencing classroom teaching effectiveness and their relationships.

3.2. Participants

The study utilized the "Questionnaire Star" platform to distribute electronic questionnaires online. Questionnaires were predominantly distributed to teachers at Pingdingshan College, Henan Urban Construction College, and Nanyang Normal University. Researchers randomly distributed questionnaires to a specified number of teachers through the school enterprise WeChat to ensure an equitable distribution of questionnaires across each school. Under the guidance of the statistical advisor from LPU Graduate School, 420 questionnaires were distributed, of which 411 were collected, yielding a collection rate of 97.8%. Among these, 411 were deemed valid.

3.3. Data gathering instrument

The questionnaire encompassed three variables: teacher competence, classroom management, and effectiveness, employing a Likert-4 scale. It was divided into four parts. The first part comprised respondents' profiles (grade, gender, educational attainment, teaching experience). The second part focused on teacher competence, structured based on the model of teachers' teaching competence in application-oriented universities [4]. It presented an evaluation system across four dimensions: teaching competence, scientific research competence, student cultivation competence, and personal attitude. The third part examined classroom management, encompassing discipline, teaching, learning, and teacher-student communication, drawing from existing questionnaire content and the actual situation of Chinese university classrooms [5]. The fourth part encompassed teaching effectiveness, covering teaching preparation, materials and methods, attitudes, professional development, and coordination of teaching administrations. It was derived from existing research content and adapted for this study [4].

3.4. Data gathering procedure

This research primarily utilized online platforms for questionnaire creation, distribution, retrieval, and evaluation. Initially, the author engaged in comprehensive communication with the leaders and teachers of the three universities via WeChat and long-distance telephone calls. The purpose and significance of the study were explained, garnering their support and cooperation in completing the questionnaire. Subsequently, the Questionnaire Star platform was employed to create the questionnaire and generate web links for its completion. The author piloted 30 questionnaires, demonstrating satisfactory reliability. A large-scale distribution of questionnaires was then conducted via WeChat and Tencent QQ to selected universities. Finally, the data collection function of Excel was utilized to ensure accuracy. To maintain questionnaire effectiveness, screening was conducted based on set principles. Firstly, a valid questionnaire completion time was set at 120 seconds. Questionnaires completed in less time were deemed invalid. Secondly, if respondents completed the questionnaire multiple times, only the first submission was considered valid.

3.5. Data analysis

Frequency and percentage distributions were employed to describe respondent profiles, while weighted averages and rankings determined teacher competence, classroom management, and effectiveness. Spearman's rho was utilized to assess significant relationships between the three variables. Likert scales were interpreted as follows: values between 3.50 and 4.00 indicated strong agreement, between 2.50 and 3.49 indicated agreement,

between 1.50 and 2.49 indicated disagreement, and between 1.00 and 1.49 indicated strong disagreement. Furthermore, all data were processed using SPSS version 26.0, with a significance level of 0.05.

3.6. Ethical considerations

Ethical considerations for this study centered on fundamental principles of respect for participants, beneficence, and justice. Informed consent was obtained, and participants and stakeholders will have unrestricted access to the finalized research report. Throughout the study, participants' autonomy and fundamental rights were respected, and informed consent was obtained for the use of scales.

4. Results and discussion

Table 1 shows the distribution of respondents' backgrounds. Analysis of the data results shows that: Among the three local undergraduate colleges in Henan Province surveyed, due to the expansion of the scale of students in local undergraduate colleges since 2000, the team of teachers has also been growing. Especially around 2002, due to the shortage of teachers, many excellent undergraduate graduates and master's students were introduced to teach in the schools. These teachers are also the ones with the longest current teaching experience, accounting for 43.8%. The proportion of female teachers is slightly higher than that of male teachers, which is a normal phenomenon. Li pointed out that young female teachers are an important part of the construction of university teachers [6]. This phenomenon is more obvious in primary and secondary schools, and society generally believes that women are more suitable for teaching. Yao analyzed the feminization of teachers and its countermeasures and found that women strive to seek institutional protection when choosing a profession, make use of gender's job-hunting advantages in the teaching profession to choose a teaching profession, and strive to maximize employment within the system [7]. In the past five years, the local undergraduate colleges in Henan Province have actively improved the quality of education, constantly increased the introduction of high-level talents, and the proportion of doctors has increased year by year, accounting for 27.5%.

Table 1. Percentage distribution of the respondent profile

Variables		Frequency	Percentage (%)
Age	21–30	151	36.7
	31–40	94	22.9
	41–50	130	31.6
	51–60	27	6.6
	>61	9	2.2
Gender	Female	244	59.4
	Male	167	40.6
Educational attainment	Bachelor's degree	66	16.1
	Master's degree	232	56.4
	Doctoral degree	113	27.5
Teaching experience	1–5	165	40.1
	6–10	66	16.1
	>11	180	43.8

Table 2 summarizes the four basic abilities of teachers from the perspective of teacher ability, and the comprehensive average value is 3.28, indicating that respondents agree with these four secondary indicators. Local undergraduate colleges are teaching-oriented colleges, so the professional ethics of teachers are more deeply rooted

in the hearts of the people, and schools pay more attention to the cultivation of teachers' teaching abilities. The three local colleges and universities involved in the survey are all third-tier and fourth-tier cities with relatively remote geographical locations and insufficient academic atmosphere. Therefore, the scientific research ability of teachers is relatively weak, and there are fewer opportunities to participate in school-enterprise cooperation.

Li surveyed 10 application-oriented demonstration schools in Henan Province, showing that there was still a certain gap between the practical teaching ability and practical teaching effect of teachers and the requirements of application-oriented demonstration schools in Henan Province [6]. The factors that affect teaching ability mainly include schools, government, enterprises, and teachers. The atmosphere of local undergraduate universities to carry out scientific research is not strong enough, which is manifested as individual research, lack of team cooperation, weak scientific research ability, low scientific research level, low proportion of provincial and national projects, weak core paper writing ability, lack of close scientific research projects and industry needs. Many full-time teachers do not have strong scientific research initiative and enthusiasm [8].

Table 2. Summary table on teaching competence

Indicators	Weighted mean	Verbal interpretation	Rank
Teaching competence	3.30	Agree	2
Research competence	3.17	Agree	4
Cultivation of student competence	3.26	Agree	3
Personality attitude	3.37	Agree	1
Composite mean	3.28	Agree	

As shown in **Table 3**, the overall mean for classroom management is 3.24, indicating that respondents generally agreed with these views. Among them, "personal communication between teachers and students" is ranked first with a score of 3.29, indicating that teachers are particularly aware of teacher-student communication in classroom management and have done a good job. Mutual respect and understanding are also important. Teachers should show understanding of students' feelings. College teachers should acknowledge students' progress and encourage them to innovate their learning styles. Teachers communicate with students respectfully, enhance students' sense of belonging, and thus cultivate responsible students. Effective communication produces better students [9]. "Teaching and learning" scored 3.20, the lowest score. Teachers rarely use peer help and individual guidance to manage students' learning. This is also a real phenomenon in local undergraduate colleges in Henan: students have learning burnout and young teachers have job burnout. Heather pointed out that various scientific research indicators are linked to the evaluation of teachers' titles and the certification of tutors' qualifications, forcing teachers to reduce their attention to teaching and students, focus on scientific research work, and repeat teaching in the classroom to achieve their interests [10].

Table 3. Summary table on classroom management

Indicators	Weighted mean	Verbal interpretation	Rank
Discipline	3.22	Agree	2
Teaching and learning	3.20	Agree	3
Teacher-students personal communication	3.29	Agree	1
Composite mean	3.24	Agree	

As seen from **Table 4**, the average value of the teaching effect summary table is 3.31. Respondents generally agreed on five aspects of teaching effectiveness. Among them, "teaching readiness" scored 3.38

points, ranking first; This was followed by "teaching materials and methods", which scored 3.34 points, both above average. The school regularly held teaching competitions and teaching supervision group lectures, so that teachers pay more attention to the improvement and innovation of teaching materials and methods. "Teaching administrative coordination," "Teaching attitude," and "Professional development" all scored slightly below average. This is due to heavy teaching tasks, professional title promotion, and other objective or subjective reasons, that some teachers will not have the time and energy to complete. Liu found that teachers have problems such as weak practical knowledge, lack of teaching research and reflection ability, occupational fatigue, narrow scope of knowledge, and inattentive and enthusiastic work [2]. In terms of the key behaviors of effective teaching, teachers have some problems, such as weak awareness of teaching goals, single teaching methods, lack of attention to control their emotions in class, lack of individual teaching communication, and untimely and unspecific guidance and evaluation of students [11]. Research on teacher effectiveness and professional competence of school teachers shows that efficient administrative coordination, pleasant classroom atmosphere, well-equipped teaching staff, library and laboratory equipment, and effective use of information and communication technology are key factors for effective teaching and learning [11].

Table 4. Summary table on teaching effectiveness

Indicators	Weighted mean	Verbal interpretation	Rank
Teaching preparation	3.38	Agree	1
Teaching materials and methods	3.34	Agree	2
Teaching attitude	3.28	Agree	4
Professional development	3.27	Agree	5
Coordination of teaching administrations	3.30	Agree	3
Composite mean	3.31	Agree	

Table 5 shows the differences in responses to teacher competence when grouped according to individual characteristics. There was no significant difference between age and teacher ability. When grouped by gender, the *P*-values of teaching ability and personal attitude were 0 and 0.007, respectively, which were much lower than the level of 0.05, indicating that there were significant differences between teachers of different genders in these two aspects. Male teachers have better teaching ability and personal learning attitude than female teachers. When teachers are grouped according to their education level, the *P*-values of the four aspects of teacher ability are all 0, indicating that there are significant differences in teacher ability among teachers with different education levels. According to the test results, teachers with doctoral degrees have a deeper and more thorough understanding of the major than teachers with graduate and undergraduate degrees and have a more systematic understanding of the training of professional students, so the teaching ability of doctors is higher than that of teachers with other degrees.

In addition, when grouped according to teaching experience, the *P*-values of teaching ability and personal attitude were 0 and 0.013 respectively, both lower than 0.05. Therefore, teaching experience significantly affects teachers' teaching ability and personal attitude. The results of the statistical test show that teachers with longer teaching experience have better evaluation results than young teachers in these two aspects. The growth of teachers, from beginners to skilled teachers, requires not only a certain knowledge base but also years of teaching practice and reflection. Those who had earned a doctorate and taught for more than 11 years were found to be better at teaching than others [12].

Table 6 illustrates the differences in responses to classroom management after grouping individual data. A significant difference was observed between the education level and the teacher-student interactions, with a *P*-value of 0.010. Data analysis indicates that Ph.D. teachers exhibit superior interpersonal communication skills

compared to their counterparts. With rich professional knowledge and mastery of academic information, Ph.D. teachers engage students by involving them in various projects and guiding them from a more professional standpoint. Conversely, in a scenario where a teacher delivers a dull class, ensuring all students remain engaged becomes challenging. The absence of learning materials may lead to student dissatisfaction, prompting gestures and distractions. These disruptions are likely to divert attention, ultimately affecting classroom dynamics. Gradually, the lack of intellectual stimulation in the classroom may permeate, causing students to prioritize other activities over the teacher's course objectives [13].

Table 5. Difference in responses on teacher competence when grouped according to profile

		F-value	*P*-value	Interpretation
Age	Teaching competence	0.682	0.409	Not significant
	Research competence	1.290	0.257	Not significant
	Cultivation of students' competence	2.838	0.093	Not significant
	Personality attitude	2.826	0.094	Not significant
Gender	Teaching competence	7.027	0.000	Significant
	Research competence	1.678	0.154	Not significant
	Cultivation of students' competence	2.290	0.059	Not significant
	Personality attitude	3.545	0.007	Significant
Educational attainment	Teaching competence	12.099	0.000	Significant
	Research competence	9.491	0.000	Significant
	Cultivation of students' competence	10.176	0.000	Significant
	Personality attitude	8.383	0.000	Significant
Teaching experience	Teaching competence	8.196	0.000	Significant
	Research competence	0.484	0.617	Not significant
	Cultivation of students' competence	2.641	0.072	Not significant
	Personality attitude	4.400	0.013	Significant

Table 6. Difference in responses on classroom management when grouped according to profile

		F-value	*P*-value	Interpretation
Age	Discipline	0.067	0.796	Not significant
	Teaching and learning	0.002	0.966	Not significant
	Teacher-students personal communication	0.332	0.565	Not significant
Gender	Discipline	0.439	0.781	Not significant
	Teaching and learning	0.298	0.879	Not significant
	Teacher-students personal communication	0.564	0.689	Not significant
Educational attainment	Discipline	2.879	0.057	Not significant
	Teaching and learning	3.013	0.050	Not significant
	Teacher-students personal communication	4.678	0.010	Significant
Teaching experience	Discipline	0.605	0.547	Not significant
	Teaching and learning	0.391	0.677	Not significant
	Teacher-students personal communication	1.409	0.246	Not significant

Table 7 shows the differences in responses to teaching effectiveness when grouped according to personal data. When grouped by gender, the *P*-value of teaching readiness was 0.031, lower than 0.05. As a result, there

are significant differences in teaching readiness between teachers of different genders, with men being rated better than women. When grouped according to education level, the *P*-values of teaching preparation, teaching materials and teaching methods, teaching attitude, professional development and teaching, and administrative department coordination were 0.002, 0.005, 0.036, 0.017, 0.008, and 0.02, respectively, all lower than 0.05. When grouped by educational level, there are significant differences in all five aspects of teaching effectiveness, with teachers with doctoral degrees rated higher than other teachers. To explore the relationship between teaching and scientific research in undergraduate teaching activities of young teachers in medical colleges and universities, an empirical method was conducted. The results show that there is a positive correlation between the undergraduate teaching effect and the scientific research ability of young full-time teachers with doctoral degrees. In addition, when grouped according to teaching experience, the *P*-value of teaching preparation is 0.008, and the calculated value is less than 0.05. There are significant differences in teaching preparation among teachers of different teaching ages, and older teachers are more fully prepared than younger teachers [14]. The growth of teachers, from beginners to skilled teachers, requires not only a certain knowledge base but also years of teaching practice and reflection.

Table 7. Difference in responses on teaching effectiveness when grouped according to profile

		F-value	P-value	Interpretation
Age	Teaching preparation	0.001	0.974	Not significant
	Teaching materials and methods	0.013	0.909	Not significant
	Teaching attitude	0.098	0.754	Not significant
	Professional development	0.154	0.695	Not significant
	Coordination of teaching administrations	1.486	0.224	Not significant
Gender	Teaching preparation	2.696	0.031	Significant
	Teaching materials and methods	1.748	0.139	Not significant
	Teaching attitude	0.829	0.507	Not significant
	Professional development	0.553	0.697	Not significant
	Coordination of teaching administrations	1.736	0.141	Not significant
Educational attainment	Teaching preparation	6.519	0.002	Significant
	Teaching materials and methods	5.396	0.005	Significant
	Teaching attitude	3.342	0.036	Significant
	Professional development	4.124	0.017	Significant
	Coordination of teaching administrations	3.935	0.020	Significant
Teaching experience	Teaching preparation	4.905	0.008	Significant
	Teaching materials and methods	2.842	0.059	Not significant
	Teaching attitude	0.657	0.519	Not significant
	Professional development	0.205	0.815	Not significant
	Coordination of teaching administrations	1.001	0.368	Not significant

The data results in **Table 8** show that there is a significant relationship between teacher ability and classroom management, indicating that teachers with strong teaching ability do better in classroom management discipline, teaching and learning, and teacher-student communication. They will pay more attention to the professional development of students and strengthen the communication between teachers and students. If the overall level of teachers is low in this respect, it will greatly affect the quality of student management, the quality of teaching, and the orderly development of educational work [15]. A positive attitude is the key to success. Teaching attitude is an important factor affecting the teaching effect, which runs through the whole teaching process. A positive teaching attitude can promote the common development of teachers and students [16].

Table 8. Relationship between teacher competence and classroom management

		r-value	*P*-value	Interpretation
Teaching competence	Discipline	0.722**	0.000	Highly significant
	Teaching and learning	0.725**	0.000	Highly significant
	Teacher-students personal communication	0.720**	0.000	Highly significant
Research competence	Discipline	0.781**	0.000	Highly significant
	Teaching and learning	0.775**	0.000	Highly significant
	Teacher-students personal communication	0.744**	0.000	Highly significant
Cultivation of students' competence	Discipline	0.843**	0.000	Highly significant
	Teaching and learning	0.845**	0.000	Highly significant
	Teacher-students personal communication	0.842**	0.000	Highly significant
Personality attitude	Discipline	0.824**	0.000	Highly significant
	Teaching and learning	0.788**	0.000	Highly significant
	Teacher-students personal communication	0.806**	0.000	Highly significant

The data in **Table 9** show that there is a significant correlation between teacher competence and teaching effect. The stronger the teacher's ability, the more effective the teacher is in teaching preparation, teaching materials and methods, teaching attitude, professional development, and teaching management coordination. Strict discipline is an effective guarantee for the smooth progress of classroom teaching. Because strict discipline is an effective guarantee for the smooth progress of classroom teaching. Therefore, teachers with strong teaching abilities are more effective in teaching and more concerned about the development of students. Teachers with strong teaching abilities will also consider students and actively coordinate teaching management [17].

Table 9. Relationship between teacher competence and teaching effectiveness

		r-value	*P*-value	Interpretation
Teaching competence	Teaching preparation	0.744**	0.000	Highly significant
	Teaching materials and methods	0.706**	0.000	Highly significant
	Teaching attitude	0.690**	0.000	Highly significant
	Professional development	0.627**	0.000	Highly significant
	Coordination of teaching administrations	0.675**	0.000	Highly significant
Research competence	Teaching preparation	0.657**	0.000	Highly significant
	Teaching materials and methods	0.657**	0.000	Highly significant
	Teaching attitude	0.693**	0.000	Highly significant
	Professional development	0.686**	0.000	Highly significant
	Coordination of teaching administrations	0.706**	0.000	Highly significant
Cultivation of students' competence	Teaching preparation	0.779**	0.000	Highly significant
	Teaching materials and methods	0.756**	0.000	Highly significant
	Teaching attitude	0.775**	0.000	Highly significant
	Professional development	0.728**	0.000	Highly significant
	Coordination of teaching administrations	0.762**	0.000	Highly significant
Personality attitude	Teaching preparation	0.786**	0.000	Highly significant
	Teaching materials and methods	0.753**	0.000	Highly significant
	Teaching attitude	0.739**	0.000	Highly significant
	Professional development	0.659**	0.000	Highly significant
	Coordination of teaching administrations	0.738**	0.000	Highly significant

Table 10 indicates a highly significant correlation between classroom management and teaching effectiveness. Effective teaching relies on proficient management, with effective classroom management serving as the foundation for seamless and efficient instruction. Without proper classroom management, or if management practices are inadequate, it can significantly impact the quality of teaching in the classroom. Classroom control is an indispensable skill; a teacher may possess a thorough understanding of course content and a strong desire to teach, but disruptions such as noise and lack of attention from students can hinder instructional outcomes. Managing a classroom is both an art and a science, beginning with cultivating a culture of respect and discipline among students in every class, thereby enhancing the overall classroom experience [18].

Table 10. Relationship between classroom management and teaching effectiveness

		r-value	*P*-value	Interpretation
Discipline	Teaching preparation	0.724**	0.000	Highly significant
	Teaching materials and methods	0.713**	0.000	Highly significant
	Teaching attitude	0.771**	0.000	Highly significant
	Professional development	0.735**	0.000	Highly significant
	Coordination of teaching administrations	0.755**	0.000	Highly significant
Teaching and learning	Teaching preparation	0.775**	0.000	Highly significant
	Teaching materials and methods	0.759**	0.000	Highly significant
	Teaching attitude	0.802**	0.000	Highly significant
	Professional development	0.783**	0.000	Highly significant
	Coordination of teaching administrations	0.807**	0.000	Highly significant
Teacher-student personal communication	Teaching preparation	0.863**	0.000	Highly significant
	Teaching materials and methods	0.831**	0.000	Highly significant
	Teaching attitude	0.843**	0.000	Highly significant
	Professional development	0.816**	0.000	Highly significant
	Coordination of teaching administrations	0.846**	0.000	Highly significant

5. Conclusion and recommendations

With the development of application-oriented undergraduate colleges, many young doctoral teachers have been recruited in recent years. These young teachers lack experience in educational and psychological knowledge, leading to a deficit in guiding students theoretically. The talent training goal of application-oriented colleges is to cultivate high-quality, application-oriented talents, necessitating teachers to enhance their scientific research abilities and guide students to actively engage in research and innovation.

Teachers should comprehend the diverse needs of students and organize additional teaching activities tailored to those needs. For instance, some students aim to enter the workforce directly after graduation, thus requiring more guidance on practical skills and literacy. Others aspire to pursue further education after college, necessitating deeper subject knowledge and theoretical guidance. By catering to individual aptitudes, teachers can meet the diverse needs of students and foster their overall development. Moreover, teachers should engage in frequent communication with student support staff. Regularly reporting students' class performance to student administrators aids in their holistic development. Professional teachers, academic mentors, and counselors should utilize weekly meetings to discuss student progress, exchange insights, and guide students

comprehensively. Schools should offer ample opportunities and platforms for teachers to exchange ideas and enhance their professional knowledge. This can be achieved by inviting high-level experts and scholars as visiting professors, advocating for the organization of various meetings, recruiting industry talents to teach, and encouraging teachers to engage in enterprise collaborations. Furthermore, schools should reduce class sizes and alleviate assessment requirements for teachers' teaching and research workload. This will afford teachers more time and energy to spearhead teaching reforms, provide personalized guidance to students, and enhance teaching effectiveness.

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Exploration of the Reform of French Language Instruction as a Second Foreign Language in Application-Oriented Colleges and Universities

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Abstract: The evolution of educational philosophies and shifting demands in talent development have exposed the limitations of traditional French language instruction as a second foreign language. To remain relevant and prepare graduates for the evolving needs of society, reforming French teaching in applied colleges and universities is crucial. This paper examines the current challenges faced by French instruction and argues for necessary reforms. It proposes practical pathways for achieving this aim in the context of applied colleges and universities. The proposal emphasizes striking a balance between teaching language knowledge and fostering language practice skills. Cultivating students' robust practice awareness and abilities can equip them to become competent applied foreign language professionals who can confidently navigate the demands of the new era.

Keywords: Education reform; Application-oriented talents training; Second foreign language teaching; Reform of French language instruction

Online publication: February 25, 2024

1. Introduction

Applied colleges and universities are dedicated to the development of applied talents, addressing the evolving requirements of societal advancement [1]. Distinct from conventional universities, which prioritize theoretical inquiry, these institutions focus on equipping students with the competency to implement advanced knowledge and technologies in practical settings, contributing to real-world productivity and daily life. Applied talents, therefore, emerge as pivotal agents of societal progression, forming the cornerstone of national revitalization and advancement. In response to contemporary demands, educators within foreign language departments of private applied institutions are urged to embrace reform, leveraging curriculum-based education as the foundation to innovate in the development of talent training mode. According to the current talent training program for English majors, there is an explicit expectation for students to not only engage deeply with their primary field of study but also acquire proficiency in a secondary foreign language. This training concept, characterized by robust foundational knowledge and a wide-ranging skill set, facilitates the future growth

of foreign language students, equipping them for the multifaceted demands of society [2]. Nonetheless, the prevailing market demands for talent remain unmet under traditional educational frameworks. Investigations across numerous universities indicate a year-on-year increase in the percentage of foreign language graduates entering employment sectors unrelated to their field of study. This trend underscores the pressing necessity to reassess and recalibrate strategies of talent cultivation in alignment with market demands, a move that bears significance not only for student personal development but also for the alignment of foreign language education with national development. Particularly in the domain of second foreign language education, such as French, a strategic overhaul beginning with curriculum design and pedagogical approaches is imperative. This overhaul aims to enhance the quality of training comprehensively, ensuring alignment between academic content and market requisites, thereby contributing genuinely valuable applied foreign language professionals to the societal fabric.

2. The current situation of French teaching as a second foreign language

As a required course for foreign language majors, the teaching of French within second foreign language programs serves as a microcosm of broader trends and challenges in second foreign language education. Extensive research at various universities and interviews with numerous French second foreign language teachers reveal significant issues within French language teaching in this context.

2.1. Shorter second foreign language teaching programs

The French as a second foreign language course, primarily for English majors, aims to reach College French Level 4 within two years, as recommended by the "Teaching Requirements for College French Courses" [3]. This is equivalent to 256 credit hours or four credits per week over four semesters. However, surveys show that many universities have significantly reduced teaching hours for second foreign languages, sometimes compressing it into a single year. Xiangtan Institute of Technology, for example, offers English and Business English majors the choice of French, Japanese, or German as a second foreign language, with French starting at 64 class hours per semester (4 hours per week) in the first year, then dropping to 2 hours per week in the second year. Given that many students have no prior experience with a second foreign language, this condensed time frame poses a significant challenge for teachers to solidify students' foundation and develop communicative skills.

2.2. Low persistence of student learning

From the actual teaching process, it is found that students do not pay enough attention to the second foreign language courses. The knowledge imparted in the classroom cannot be separated from the sorting and consolidation after class. With limited time and energy, students can often only focus on the study of their major subjects, and often have no time to take into account the study of their second foreign language. The lack of necessary independent learning time not only affects students' mastery of the knowledge they have learned but also hinders the absorption and connection of new knowledge. Many students start learning a new foreign language with enthusiasm, but over time lose enthusiasm and confidence and give up halfway.

2.3. A single method of course assessment

After conducting field research at several universities, it was observed that the second foreign language course evaluation heavily depends on written examinations in its traditional teaching model. The assessment of courses predominantly relies on written scores, constituting a substantial proportion of the overall evaluation, typically

ranging from 60% to 70%. The assessment content is predominantly centered around teaching materials, with an excessive emphasis on evaluating grammar and vocabulary knowledge [4]. Under the sway of an assessment system overly reliant on examinations, students' educational priorities have shifted to exam preparation, leading to an excessive fixation on textbook knowledge. Consequently, their enthusiasm and interest in improving their language proficiency and practical application skills have significantly waned.

2.4. The dilemma of the second foreign teacher facing teaching reform

Teachers encounter various challenges when implementing reforms in French as a second foreign language in the current context. Given the placement of French as a second foreign language in the curriculum, teachers must balance the development of comprehensive language skills, including listening, speaking, reading, and writing, within a limited time frame. Many teachers in second foreign language schools often lean towards traditional teaching methods to enhance students' written scores and assist them in passing the College French Test Band 4 (CFT4) and postgraduate entrance examinations. This preference stems from the immediate results that traditional methods provide. As a result, many teachers remain conservative in their approach to teaching. In particular, the applied talent teaching model, focusing on student-centered and language practice, gives less priority to improving test scores. Moreover, the applied talent model requires more instructional time, which poses a challenge given detailed school regulations on teaching content and semester progress. Given the meticulous regulations set forth by schools regarding the content and pace of instruction for each semester, failure to effectively manage the teaching process in the implementation of educational reforms would not only result in inadequate attainment of desired educational outcomes but also impede teachers from fulfilling mandated teaching obligations, thereby disrupting the overall teaching schedule. Consequently, many teachers harbor apprehensions about engaging in teaching reforms and are inclined to adhere to traditional teaching methodologies.

3. Innovations in the second foreign language (French) teaching approach

To better adapt to the evolving demands of the era and to meet society's need for skilled individuals, reforming the teaching model for second foreign language education is essential. However, striking a balance between imparting language knowledge and practical skills, introducing innovative teaching methodologies, and effectively fostering students' interest and engagement are pivotal considerations in the reform process. In pursuit of this objective, several reform initiatives were actively undertaken, yielding promising initial results. These reforms are firmly centered on the goal of nurturing applied talents. They encompass the implementation of the "Check-in Learning Mode" to enhance students' oral communication proficiency, innovative integration of moral education into classroom instruction, and refinement of the course assessment framework. By doing so, the aim is to achieve a more comprehensive and profound innovation and breakthrough in the teaching of French as a second foreign language, thereby meeting the evolving needs of contemporary society and preparing students for success in an increasingly globalized world.

3.1. Implementation of the "Check-in Learning Mode" to enhance oral proficiency in a second language

In the milieu of the "Internet+" era, the emergence of mobile learning represents a burgeoning trend, distinguished by its unparalleled flexibility accessible to anyone, anywhere, anytime, and in any style [5]. The proliferation and integration of a myriad of mobile learning applications on handheld devices empower university students to capitalize on intermittent periods, transcending traditional temporal and spatial limitations

to pursue self-guided learning endeavors. Despite its potential, mobile learning encounters specific obstacles in practical scenarios, such as the risk of fragmenting the learning continuum, which may impede the construction of a holistic knowledge framework, and the deficiency in students' self-regulatory and autonomous learning capacities, which challenge the sustainability of mobile learning initiatives [6]. In response to these impediments and to invigorate student engagement in self-directed learning, the "Check-in Learning Mode" has been introduced. Teachers can meticulously orchestrate semester-long learning activities, crafting a structured educational agenda, and leveraging the check-in protocol to monitor and motivate, ensuring timely completion of academic undertakings and fostering significant advancements in self-learning outcomes.

In the field of foreign language education, the deployment of self-directed learning strategies, augmented by check-in oversight, has proven to be instrumental in extending language training beyond conventional classroom boundaries. This model serves as a vital complement to language skills, such as listening and speaking, which may not receive comprehensive attention within classroom settings. The synergistic integration of classroom instruction and extracurricular autonomous practice not only bolsters students' application and independent learning capabilities but also amplifies the pedagogical impact, positioning students as the central figures in their language learning. They are actively involved in and enjoy the language learning process. For instance, Xiangtan Institute of Technology has adeptly utilized a check-in application in its French as a second language curriculum, instituting weekly oral practice assignments that are pragmatically oriented. These assignments encompass a spectrum of real-life scenarios – ranging from restaurant reservations to medical consultations, shopping excursions, and international travel – with provided dialogues serving as a reference. Learners are encouraged to form conversation groups, practicing scenario-based dialogues based on their understanding of the provided texts. Analysis of these oral practice engagements reveals a direct correlation between the consistency of check-in participation and the improvement in task performance. A detailed examination of a learner's progress through the various stages of the check-in exercises reveals notable improvements in French pronunciation accuracy and mastery of speech rate and intonation among those who maintain regular participation. This underscores the critical role of consistent check-in activities in strengthening language skills. Furthermore, the requirement for collaborative completion of check-in exercises not only fosters mutual encouragement and supervision among peers but also cultivates a constructive competitive spirit throughout the collective check-in process, markedly boosting motivation towards completing tasks.

3.2. Integrating moral education into second foreign language teaching

In addition to fostering students' ability to use foreign languages for effective communication, foreign language teachers should also prioritize guiding students in establishing their ideals and shaping their values, thereby integrating moral education into their teaching practices [7]. As a compulsory component of the curriculum for English majors, the second foreign language class serves as a crucial avenue for students to broaden their international perspectives and enhance their intercultural communication skills. In the context of studying French as a second foreign language, the curriculum should not only focus on developing students' listening, speaking, reading, and writing skills in French but also emphasize the importance of foreign language acquisition. It is essential to instill in students a clear understanding of the broader implications of language learning, empowering them to cultivate a sound worldview, values, and unwavering cultural confidence. In addition, students should be encouraged to embrace and respect diverse civilizations, fostering a deeper appreciation for cultural exchange and the vision of a community with a shared future for mankind. Consequently, second foreign language courses should collaboratively fulfill the educational mission alongside other language programs, harmonizing the transmission of knowledge with the guidance of values. In this way,

educators can lay a solid foundation for the holistic development of students.

Compared to the depth of English major courses, elementary-level content in second foreign language courses tends to be more basic, focusing primarily on the study of phonetics. This emphasis can make it challenging to naturally integrate discussions of moral education. Thus, effectively integrating these elements into the classroom presents both a challenge to teachers' teaching skills and an opportunity for innovative content design. Taking Xiangtan Institute of Technology as an example, each time a unit of teaching content is completed, the special teaching module "Speaking Chinese in French" is set up. The content is based on the sentence patterns learned in this unit and introduces Chinese society and culture to students through the combination of pictures and texts. Take the second foreign French textbook "New Public French" as an example [8]: in Lesson 1, students learn to use the interrogative pronoun *Qui* to ask questions about someone's identity. In this teaching module, the author utilizes the phrase "*Qui est-ce?*" (Who is this?) and answers "*C'est le Président Xi.*" (This is President Xi.), so that students can feel and apply what they have learned in real contexts, and at the same time cultivate their interest and get used to introducing Chinese society and culture in French. In the second lesson, students learn the phrase "*Qu'est-ce que c'est?*" (What is this?). This sentence pattern is practically utilized through the response "*C'est la Cité Interdite.*" (This is the Forbidden City.) Another example is the new phrase "*Où allez-vous?*" (Where are you going?) in Lesson Four, the answer is set to "*Je vais à la Grande Muraille.*" (I'm going to the Great Wall.) Through this series of teaching designs, students can truly feel the close integration of language learning and real life, and experience the fun of introducing China in French. According to the feedback from the class, the students are generally happy to accept this kind of teaching method [9].

3.3. Enrichment of course assessment system

To ensure that innovations in talent cultivation programs and course teaching designs are effectively reflected in students, it is crucial to enrich the course assessment and evaluation system. In reforming the assessment of second foreign language courses, the primary goal should be to enhance students' learning outcomes by adopting a multidimensional assessment approach. The variety of assessment methods not only stimulates students' interest in learning but also enhances their independent learning ability [10]. Specifically, teachers should communicate course assessment standards to students at the beginning of the semester to ensure that assessments are aligned with the focus of course learning and to promote the concept of "assessment for learning." In terms of assessment content, more emphasis should be placed on process assessment within the course. This includes evaluating students' application skills and encouraging them to apply their knowledge flexibly. For instance, in the context of check-in learning exercises, teachers could include these tasks in the process evaluation, provide regular updates on students' completion status, and actively engage students in the evaluation process. Furthermore, the assessment forms for French as a second language curriculum should be diversified. Traditional final exams should be replaced by diverse forms such as defenses, group discussions, and dissertation reports to reduce the reliance on written exams. Additionally, interdisciplinary and cross-cultural knowledge should be integrated into assessments, with an emphasis on application and critical thinking questions to encourage students to not limit themselves to textbook knowledge and embrace innovative approaches to learning. In summary, throughout the construction of the course assessment system, the core objective of training applied talents should be consistently prioritized. By integrating theory and practice, a harmonious interaction between course assessment and teaching can be achieved, which ultimately enhances the effectiveness of students' learning.

4. Conclusion

The reform of teaching French as a second foreign language is an essential response to the evolving demands of the times and the changing requirements of talents. Aligned with the goal of cultivating applied talents, the second foreign language curriculum must evolve, enriching and innovating teaching content while seamlessly integrating moral education with foreign language teaching. Establishing a multi-dimensional evaluation mechanism and diversifying assessment forms are feasible strategies to effectively improve students' language application skills and foster innovative thinking. Moreover, it is crucial to emphasize the dynamic link between classroom language teaching and extracurricular autonomous practice. This approach fully harnesses and stimulates students' autonomy and initiative in learning. It is imperative to recognize that the teaching reform of the French as a second language curriculum is a challenging and ongoing task that requires the active involvement and unremitting efforts of teachers. Teachers must courageously embrace the responsibility of teaching reform, continually improve their teaching proficiency and skills, and dare to break free from traditional constraints. Only through such dedication can the obstacles and challenges inherent in the reform process be overcome and the teaching reform of French as a second foreign language continuously advanced. In doing so, a significant contribution will be made to cultivating high-quality talents equipped with both an innovative spirit and practical skills, thus making a meaningful impact on society's evolving talent needs.

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Professional Competence, Teaching Pedagogy, and Assessment Practices: Basis for Enhanced Faculty Development Plan

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Abstract: This study investigates the interplay between professional competence, teaching pedagogy, assessment practices, and faculty development plans in Chinese universities. Employing descriptive quantitative research, data was collected using a questionnaire with a high Cronbach's alpha score (>0.900). The study involved 405 college teachers from three universities in Anhui Province, China. Results indicate that a strong foundation of professional competence, effective teaching pedagogy, and appropriate assessment practices significantly contribute to faculty development. Respondents reported employing diverse teaching strategies and assessment practices, resulting in positive teaching outcomes and professional growth. The findings provide valuable insights for administrators and educators to enhance faculty development in Chinese universities. Future research should explore additional challenges and considerations to further advance faculty development efforts.

Keywords: Professional competence; Teaching pedagogy; Assessment practice; Faculty development plan

Online publication: February 25, 2024

1. Introduction

In the intricate tapestry of education, teachers assume the pivotal role of weavers, shaping the minds and futures of upcoming generations. Their duty surpasses mere knowledge dissemination; it involves nurturing intellects, fostering critical thinking, and sculpting characters. The impact of teachers extends far beyond the confines of classrooms, permeating into the very fabric of society. As conduits of knowledge and societal pillars, teachers undertake multifaceted and complex social responsibilities [1]. They act as catalysts for both intellectual and moral development, thereby significantly influencing individual trajectories and, by extension, the advancement of communities and nations.

Contemporary education dynamics necessitate a deep comprehension of the multifaceted dimensions constituting effective teaching. Professional competence, teaching pedagogy, and assessment practices emerge as pivotal variables, each contributing uniquely to educators' holistic development. To unravel the intricacies of these variables is to unveil the complexities of effective teaching, paving the path for more nuanced and

responsive faculty development plans. At the heart of any thriving society lies an education system, with teachers serving as its core foundation. Teachers are not mere purveyors of information; they are architects of the future, molding young minds and imparting the knowledge, skills, and values necessary for navigating the complexities of the world. In society, teachers serve as beacons of progress, cultivating the intellectual and moral capital of the next generation.

In the realm of education, teachers act as linchpins connecting curriculum, institutional objectives, and student outcomes. Their adeptness at navigating the evolving educational landscape is pivotal in shaping the quality of learning experiences. Moreover, the teacher-student relationship is symbiotic, with effective teaching resonating through students' achievements and personal growth.

Teachers are transformative agents, shaping not only the academic prowess of their students but also their character, values, and worldview. However, amidst these transformative roles, teachers encounter various challenges. Gui *et al*. identified several factors influencing education, including teaching methods, evaluation techniques, student engagement, teacher qualifications, parental and societal expectations, disparities between school and family values, and parental communication [2]. Consequently, understanding and enhancing teachers' competencies, pedagogies, and assessment practices become imperative in ensuring the continuous growth and resilience of educational systems.

Professional competence encompasses the knowledge, skills, and attitudes empowering teachers to excel in their roles. Delving into this dimension enables an exploration of the foundational elements distinguishing effective teaching. Some scholars also believe that professional capabilities refer to the abilities that teachers should possess in various practices [3]. Professional competencies include various psychological characteristics and conditions with professional attributes that teachers, as professional technicians, should possess in teaching activities. These encompass teaching abilities, organizational management abilities, professional reflection abilities, scientific research abilities, and communication and cooperation abilities, among others [4].

Research on professional competence encounters challenges in defining and measuring its multifaceted aspects. While there's emphasis on subject knowledge and pedagogical skills, less attention is given to socio-emotional competencies, cultural responsiveness, and adaptability to diverse contexts. Additionally, longitudinal studies examining how professional development impacts teacher effectiveness over time are lacking. Moreover, research often lacks alignment with real-world classroom challenges, hindering practical application and relevance.

Exploring teaching pedagogy involves unraveling the methodologies that resonate most with diverse learner needs. The significance of pedagogy lies in its potential to influence the quality of learning experiences. Despite various instructional approaches, there's a gap in understanding how these strategies interact with diverse student populations and learning contexts. Furthermore, socio-cultural aspects of teaching and learning are often overlooked, impacting equitable instructional outcomes.

Assessment practices serve as a linchpin in the educational process, offering insights into student progress and informing instructional decisions. While various assessment types exist, there's a gap in understanding their effectiveness in different contexts. Moreover, the overemphasis on standardized testing neglects the importance of formative assessment and cultural responsiveness. Addressing these gaps requires a commitment to inclusive and equitable assessment practices, alongside innovative research methodologies.

By focusing on professional competence, teaching pedagogy, and assessment practices, this study integrates key variables influencing teaching effectiveness. The research offers evidence-based recommendations for enhancing teaching quality, thereby facilitating the continuous improvement of educational institutions and fostering a culture of excellence in teaching and learning.

2. Study objectives

The study aimed to evaluate the professional competence, teaching methods, and assessment practices of college teachers in China. It examined demographic characteristics such as age, gender, education level, and experience. Professional competence was assessed across various dimensions including subject knowledge, research capabilities, teaching qualities, technology proficiency, and professional development. Assessment practices encompassed tools, strategies, formats, and data analysis. Statistical analysis explored differences and correlations among these factors. The study recommended a faculty development plan to enhance identified areas of improvement.

3. Materials and methods

3.1. Research design

The study employed a descriptive research design, aiming to systematically describe the professional competence, teaching pedagogy, and assessment practices of college teachers in China. Utilizing a quantitative approach, numerical data were collected through survey questionnaires developed by the researcher. Descriptive research in education helps analyze phenomena, identify trends, and evaluate interventions, ultimately informing policy, enhancing teaching practice, and supporting evidence-based decision-making.

3.2. Study participants

The study included 405 teachers from 3 selected universities out of a total of 2,982 for the Academic Year 2023–2024. Inclusion criteria comprised active teaching staff with at least one year of teaching experience, regardless of subject or specialization. Random sampling ensured equal opportunity for participation.

3.3. Instruments

The instruments utilized in this study consisted of a carefully adapted questionnaire comprising three scales: professional competence of teachers, teaching pedagogy of teachers, and assessment practices of teachers. These scales were developed based on existing literature and tailored to align with the study's objectives.

To ensure the reliability of the questionnaire, it underwent content validity assessment and pilot testing with 50 participants from a Chinese university. The resulting reliability coefficient for each scale exceeded 0.9, indicating excellent reliability and strengthening the confidence in the questionnaire's effectiveness.

The questionnaire comprised four parts: the first collected demographic information including age, gender, length of service, and highest educational attainment. The second scale, adapted from Hu's publication (2023), titled "A Survey on the Current Status of Education for Normal Students in Local Normal Colleges – Taking the Mathematics and Applied Mathematics Major of Yulin Normal University as an Example," assessed professional competence across five dimensions. The third scale, adapted from Cui's doctoral thesis (2023), titled "Research on the Construction and Application of Teachers TPDCK Knowledge Framework in Smart Teaching Environment," focused on teaching pedagogy across four dimensions. The fourth scale, adapted from Wang's master's thesis (2022), titled "Research on Secondary Vocational Teaching Evaluation – Taking the Teaching Evaluation of 'Fundamentals of Economics' Portfolio as an Example," analyzed assessment practices across four dimensions. Modifications were made to ensure alignment with the study's objectives and participants' needs, with adjustments made for clarity and relevance.

Recognizing the importance of integrating competence, pedagogy, and assessment, modifications were made to align the scales with fundamental measures in faculty development plans. This comprehensive design

aimed to explore the relationships among these variables and their impact on the enhanced faculty development plan.

Overall, the questionnaire was meticulously crafted to accurately capture participants' professional competencies, pedagogical practices, and assessment realities. By utilizing these scales, the study sought to provide valuable insights into the factors influencing faculty development and contributing to informed decision-making in educational practice.

3.4. Procedure

After the validated questionnaire passed the reliability test, it was distributed using the online platform Questionnaire Star in China, facilitating efficient data collection. Participants from selected universities completed the questionnaires, which included scales measuring professional competence, teaching pedagogy, and assessment practices. They were instructed to provide honest responses based on their experiences.

Once data collection concluded, the collected data were prepared for analysis. They were exported from the platform and imported into SPSS version 22.0 for statistical treatment. SPSS offers diverse tools suitable for descriptive analysis, making it ideal for this study.

Descriptive statistical analysis was conducted to examine the data. Frequencies, percentages, weighted mean, and standard deviations were computed to offer a comprehensive overview of participants' behaviors and attitudes regarding professional competence, teaching pedagogy, and assessment practices.

Following data analysis, results were interpreted and synthesized to draw meaningful conclusions. Findings were aligned with research objectives, and significant patterns or trends identified during descriptive analysis were highlighted. The implications of the results were discussed within the context of professional competence, teaching pedagogy, and assessment practices.

This rigorous process ensured a thorough understanding of participants' perspectives and provided valuable insights into the factors influencing faculty development in China's educational landscape. The findings contribute to informed decision-making and potential improvements in teaching practices and educational policies.

3.5. Data analysis

The data analysis for the study was done using SPSS 22.0, which used descriptive statistical techniques. Calculating descriptive statistics such as means, standard deviations, frequencies, and percentages was required. Combination and weighted means to assess the general and particular variable measures. A P-value of < 0.05 is considered statistically significant.

The Likert scale was useful in evaluating the actions of the participants. Likert scales were interpreted as follows: values between 3.50 and 4.00 indicated strong agreement, between 2.50 and 3.49 indicated agreement, between 1.50 and 2.49 indicated disagreement, and between 1.00 and 1.49 indicated strong disagreement. Other studies addressed specific research topics such as frequency distribution, percentage, rank, and t-tests. Together, these statistical techniques gave participants information about their professional competence, teaching pedagogy, and assessment practices, as well as their behaviors, attitudes, and performance.

3.6. Ethical considerations

Participants' identities remained confidential to uphold privacy. Researchers ensured data analysis respected participants' feelings and accurately represented their contributions. Findings were presented objectively, without personal opinions. Participants were assured of confidentiality and exclusive research use.

4. Results and discusion

Table 1 provides a comprehensive overview of the demographic characteristics of the 405 respondents. The data reveals that the majority of respondents fall within the age range of 31–40 years, comprising 45.2% of the sample. This suggests a significant representation of mid-career professionals. The second-largest age group is 41–50 years, indicating a substantial proportion of experienced educators. The distribution across various age groups reflects a diverse range of experiences and perspectives among the respondents.

In terms of gender, the survey results indicate a predominance of female respondents, comprising 69.6% of the sample. This gender distribution may influence the study's findings, considering potential gender-related variations in teaching practices and professional development needs.

Regarding length of service, a notable proportion of respondents (31.9%) have 16 years or more of experience, indicating a significant representation of seasoned educators. However, there is also a considerable presence of respondents with 4–9 years of experience (28.1%), suggesting a mix of experienced and relatively new faculty members.

The educational attainment profile of the respondents reveals that the majority hold a bachelor's degree (72.6%), followed by master's (16.3%) and doctoral degrees (11.1%). This distribution underscores the importance of accommodating individuals with varying educational backgrounds in faculty development programs.

Overall, the demographic data highlights the diversity within the sample population, encompassing variations in age, gender, teaching experience, and educational qualifications. These insights are essential for understanding the nuanced dynamics of professional competence, teaching pedagogy, and assessment practices in the context of the enhanced faculty development plan outlined in the doctoral paper.

Table 1. Percentage distribution of the respondents' profile

		Frequency	Percentage (%)
Age (years)	21–30	84	20.7
	31–40	183	45.2
	41–50	104	25.7
	51–60	31	7.7
	> 61	3	.7
Gender	Male	123	30.4
	Female	282	69.6
Length of service (years)	< 4	82	20.2
	4–9	114	28.1
	10–15	80	19.8
	> 16	129	31.9
Highest educational attainment	Bachelor's degree	294	72.6
	Master's degree	66	16.3
	Doctoral degree	45	11.1

Table 2 provides an overview of the professional competence of teachers measured within this study. These competencies, encompassing subject matter knowledge, capabilities of academic and science research, personal qualities as a teacher, and modern technology knowledge, collectively demonstrate the competencies

teachers need to complete teaching. The overall composite mean of 3.26 falls within the "Agree" range, indicating a positive perception of faculty competence in the areas assessed.

Many studies prove that the application of modern technology in teaching is widespread, but it is also one of the challenges to developing teachers' professional competence. Dahri *et al*. underscored the obstacles encountered in delivering professional development programs for teachers, citing limitations such as restricted resources and reliance on traditional training approaches. They note a growing trend of incorporating mobile technology into professional development initiatives due to its flexibility and cost-effectiveness. However, they argue that existing frameworks inadequately support the seamless integration of technology into these programs [5].

Safina *et al.* acknowledged Miller's work, which evaluated the significance of specific personal qualities and professional competencies according to administrators within the Louisiana public school system [6]. The study aimed to identify the attributes deemed most crucial for the success of classroom teachers, as perceived by these administrators.

Table 2. Summary table on professional competence of teachers

Indicators	Weighted mean	Verbal interpretation	Rank
Subject matter knowledge	3.31	Agree	2
Capabilities of academic and science research	3.15	Agree	4
Personal qualities as a teacher	3.33	Agree	1
Modern technology knowledge	3.23	Agree	3
Composite mean	3.26	Agree	

Karakose *et al*. surveyed prospective mathematics teachers enrolled in seven university faculties of education across various regions of Turkey. They found that these prospective teachers, who exhibited positive attitudes toward the teaching profession, paradoxically experienced higher levels of anxiety related to classroom management [7]. This finding suggests that teachers' anxiety about classroom management may be attributed to the importance they place on this aspect of teaching, consistent with the result that classroom management ranked as their primary concern.

In summary, the table indicates that effective classroom management and a strong understanding of teaching methods are perceived as the most crucial elements in teaching pedagogy. Professional development is also considered important while teaching innovation ability is considered valuable but ranks slightly lower in priority according to the respondents. The composite mean reinforces the overall agreement on the importance of these pedagogical aspects.

Table 3. Summary table on teaching pedagogy

Indicators	Weighted mean	Verbal interpretation	Rank
Teaching method knowledge	3.32	Agree	2
Classroom management	3.34	Agree	1
Teaching innovation ability	3.24	Agree	4
Professional development	3.31	Agree	3
Composite mean	3.30	Agree	

Table 4 provides a summary of the assessment practices of teachers from four dimensions: usage of

assessment tools, assessment strategy, approaches or format for assessment, data analysis, and application. The overall composite mean of 3.18 reflects a general agreement among teachers regarding the importance of these assessment practices. The balanced view indicates teachers value a holistic approach, incorporating data analysis, varied assessment tools, strategic planning, and diverse assessment formats to ensure effective teaching.

The selection of classroom teaching evaluation methods should be consistent with the purpose of evaluation and the value orientation of evaluation. This requirement cannot be fulfilled by a single evaluation method. Each evaluation subject can choose appropriate evaluation methods based on their value needs, including theoretical, scientific, and artistic evaluation methods [8]. Above all, carrying out effective learning and appropriate classroom assessment could be highly challenging for the teachers to do.

Table 4. Summary table on assessment practices of teachers

Indicators	Weighted mean	Verbal interpretation	Rank
Usage of assessment tools	3.20	Agree	2
Assessment strategy	3.16	Agree	3
Approaches or format for assessment	3.13	Agree	4
Data analysis and application	3.24	Agree	1
Composite mean	3.18	Agree	

Table 5 compares responses on professional competence when categorized based on profile. It was observed that there was a significant difference in subject matter knowledge and capabilities of academic and scientific research when grouped according to age, suggesting that age has an impact on the perceived subject matter knowledge of teachers, indicating that age affects perceptions of teachers' research capabilities.

New teachers with different teaching experiences show extremely significant differences in teaching practice ability and comprehensive education ability, significant differences in teacher ethics practice ability, and no independent development ability [9]. There are significant differences, indicating that the characteristics of teaching experience have the greatest impact on the teaching practice and comprehensive educational ability of new teachers. New teachers with different teaching experiences show extremely significant differences in teaching practice ability and comprehensive education ability, significant differences in teacher ethics practice ability, and no independent development ability. There are significant differences, indicating that teaching experience characteristics have the greatest impact on new teachers' teaching practices and comprehensive educational abilities.

In summary, the result indicates that age, gender, length of service, and highest educational attainment have varying levels of impact on the perceived professional competence of teachers, particularly in the areas of subject matter knowledge and capabilities of academic and scientific research.

Table 5. Differences in responses on the professional competence of teachers when grouped according to profile

		λ2c / U	*P*-value	Interpretation
Age	Subject matter knowledge	15.104	0.004	Significant
	Capabilities of academic and scientific research	10.651	0.031	Significant
	Personal qualities as a teacher	4.604	0.330	Not significant
	Modern technology knowledge	2.262	0.688	Not significant

Table 5 (Continue)

		λ2c / U	*P*-value	Interpretation
Gender	Subject matter knowledge	14,284.5	0.004	Significant
	Capabilities of academic and scientific research	13,589.0	0.000	Highly significant
	Personal qualities as a teacher	15,219.5	0.042	Significant
	Modern technology knowledge	14,921.5	0.020	Significant
Length of service	Subject matter knowledge	18.491	0.000	Highly significant
	Capabilities of academic and scientific research	11.324	0.010	Significant
	Personal qualities as a teacher	14.330	0.002	Significant
	Modern technology knowledge	4.856	0.183	Not significant
Highest educational attainment	Subject matter knowledge	9.179	0.010	Significant
	Capabilities of academic and scientific research	0.790	0.674	Not significant
	Personal qualities as a teacher	6.865	0.032	Significant
	Modern technology knowledge	0.609	0.737	Not significant

Table 6 compares responses on teaching pedagogy when grouped according to profile. Notably, except for professional development and classroom management, the computed *P*-values for each profile were all above 0.05. This suggests no statistically significant differences in responses based on age, gender, length of service, and highest educational attainment.

These results imply uniformity in teaching pedagogy when grouped according to profile. For instance, exploring the impact of age on teaching pedagogy reveals intriguing insights. The data indicates no significant variations across dimensions of teaching method knowledge, classroom management, teaching innovation ability, and professional development, consistent with Zhang *et al*.'s research results [10]. Novice teachers often have relatively new educational concepts and methods, dare to break through the constraints of regulations, and can provide multiple understandings for the community of practice, promote the reproduction of practical wisdom, and realize the innovative development of the community of practice.

In summary, the result suggests that, overall, age and highest educational attainment do not significantly impact the perceived teaching pedagogy of individuals. However, there are some variations based on gender and length of service, with classroom management and professional development showing significance in the context of gender, and teaching method knowledge showing significance in the context of length of service.

Table 6. Differences in responses on teaching pedagogy when grouped according to profile

		λ2c / U	*P*-value	Interpretation
Age	Teaching method knowledge	2.900	0.575	Not significant
	Classroom management	3.750	0.441	Not significant
	Teaching innovation ability	3.421	0.490	Not significant
	Professional development	2.041	0.728	Not significant
Gender	Teaching method knowledge	15,500.5	0.071	Not significant
	Classroom management	15,210.5	0.041	Significant
	Teaching innovation ability	16,401.5	0.361	Not significant
	Professional development	15,244.0	0.038	Significant

Table 6 (Continue)

		λ2c / U	*P*-value	Interpretation
Length of service	Teaching method knowledge	9.592	0.022	Significant
	Classroom management	7.149	0.067	Not significant
	Teaching innovation ability	3.109	0.375	Not significant
	Professional development	7.584	0.055	Not significant
Highest educational attainment	Teaching method knowledge	3.262	0.196	Not significant
	Classroom management	4.204	0.122	Not significant
	Teaching innovation ability	2.694	0.260	Not significant
	Professional development	4.157	0.125	Not significant

Table 7 compares responses on the assessment practices of teachers when they are categorized by various demographic profiles. Except for approaches or format for assessment, when grouped according to age, all computed *P*-values exceeded 0.05, indicating no statistically significant differences across profiles. This suggests a uniform perception of assessment practices of teachers.

The significant result for "approaches or format for assessment" in the age group suggests that university teachers may need to consider age-related factors when designing assessments. This could involve adapting assessment formats to align with the preferences or learning styles of different age groups. However, it is crucial to interpret these findings cautiously and consider the context of the specific university setting and the characteristics of the teacher population involved in the study.

Among the demographic analyses conducted, differences in assessment approaches or formats were slightly significant when teachers were grouped by age, possibly due to generational disparities, technological proficiency, or pedagogical preferences. This suggests a need for considering age-related factors when designing assessments to align with diverse learning styles. However, caution is urged in interpretation, considering specific university contexts and teacher characteristics. Notably, no significant differences were found based on gender, length of service, or educational attainment, indicating consistent assessment practices regardless of these demographics among university teachers.

Table 7. Differences in responses on the assessment practices of teachers when grouped according to profile

		λ2c / U	*P*-value	Interpretation
Age	Usage of assessment tools	3.966	0.411	Not significant
	Assessment strategy	1.469	0.832	Not significant
	Approaches or format for assessment	9.648	0.047	Significant
	Data analysis and application	5.317	0.256	Not significant
Gender	Usage of assessment tools	16,398.5	0.359	Not significant
	Assessment strategy	16,424.0	0.375	Not significant
	Approaches or format for assessment	16,395.5	0.361	Not significant
	Data analysis and application	17,008.5	0.738	Not significant

Table 7 (Continue)

		λ2c / U	*P*-value	Interpretation
Length of service	Usage of assessment tools	2.284	0.516	Not significant
	Assessment strategy	4.601	0.203	Not significant
	Approaches or format for assessment	2.833	0.418	Not significant
	Data analysis and application	1.919	0.589	Not significant
Highest educational attainment	Usage of assessment tools	9.179	0.790	Not significant
	Assessment strategy	0.010	0.674	Not significant
	Approaches or format for assessment	9.179	0.790	Not significant
	Data analysis and application	0.010	0.674	Not significant

Table 8 displays the association between professional competencies and teaching pedagogy. The computed r-values indicate a strong direct correlation and the resulting *P*-values were less than 0.05. Online teaching experience will affect teachers' classroom teaching [11]. This suggests a significant relationship between professional competence and teaching pedagogy, indicating that the more proficient teachers are in their professionalism, the better their teaching methods tend to be. When confronted with new technologies, teachers proactively and cautiously explore the integration of technology and subject teaching [11].

In summary, these findings underscore the interconnectedness of various professional competencies and their association with effective teaching pedagogy. From a university teacher's perspective, focusing on continuous professional development, integrating technology into teaching practices, and fostering a strong foundation in subject matter knowledge enhance teaching effectiveness across diverse aspects.

Table 8. Relationship between professional competencies and teaching pedagogy

		rho-value	*P*-value	Interpretation
Subject matter knowledge	Teaching method knowledge	0.714**	0.000	Highly significant
	Classroom management	0.676**	0.000	Highly significant
	Teaching innovation ability	0.633**	0.000	Highly significant
	Professional development	0.676**	0.000	Highly significant
Capabilities of academic and scientific research	Teaching method knowledge	0.747**	0.000	Highly significant
	Classroom management	0.678**	0.000	Highly significant
	Teaching innovation ability	0.688**	0.000	Highly significant
	Professional development	0.727**	0.000	Highly significant
Personal qualities as a teacher	Teaching method knowledge	0.684**	0.000	Highly significant
	Classroom management	0.674**	0.000	Highly significant
	Teaching innovation ability	0.663**	0.000	Highly significant
	Professional development	0.679**	0.000	Highly significant
Modern technology knowledge	Teaching method knowledge	0.757**	0.000	Highly significant
	Classroom management	0.722**	0.000	Highly significant
	Teaching innovation ability	0.738**	0.000	Highly significant
	Professional development	0.726**	0.000	Highly significant

Table 9 reveals the association between professional competencies and assessment practices of teachers. The computed r-values indicate a strong direct correlation. Classroom teaching evaluation can promote teacher professionalism and classroom teaching [8]. The resulting *P*-values were all below 0.05, signifying significant relationships.

This suggests a significant relationship between professional competence and the quality of teachers' assessment practices, indicating that the more competent teachers are in their professionalism, the better their assessment practices tend to be. As research on assessment has grown, so has the link between assessment and teacher competency. Mou proposed the significance of continued in-depth research based on dynamic assessment [12].

The results suggest that teachers with higher competencies in these areas tend to employ diverse assessment practices effectively. The overall findings emphasize the integral connection between teachers' proficiency in subject matter, research skills, personal qualities, and technological knowledge with their adept utilization of assessment tools and strategies in the educational context.

Table 9. Relationship between professional competencies and assessment practices of teachers

		rho-value	*P*-value	Interpretation
Subject matter knowledge	Usage of assessment tools	0.607**	0.000	Highly significant
	Assessment strategy	0.604**	0.000	Highly significant
	Approaches or format for assessment	0.544**	0.000	Highly significant
	Data analysis and application	0.603**	0.000	Highly significant
Capabilities of academic and scientific research	Usage of assessment tools	0.641**	0.000	Highly significant
	Assessment strategy	0.674**	0.000	Highly significant
	Approaches or format for assessment	0.601**	0.000	Highly significant
	Data analysis and application	0.658**	0.000	Highly significant
Personal qualities as a teacher	Usage of assessment tools	0.681**	0.000	Highly significant
	Assessment strategy	0.655**	0.000	Highly significant
	Approaches or format for assessment	0.605**	0.000	Highly significant
	Data analysis and application	0.680**	0.000	Highly significant
Modern technology knowledge	Usage of assessment tools	0.684**	0.000	Highly significant
	Assessment strategy	0.692**	0.000	Highly significant
	Approaches or format for assessment	0.615**	0.000	Highly significant
	Data analysis and application	0.690**	0.000	Highly significant

Table 10 illustrates the association between teaching pedagogy and assessment practices of teachers. The computed r-values indicate a strong direct correlation, and the resulting *P*-values were less than 0.05. This suggests that a significant relationship exists, implying that the better the teaching pedagogy, the better the teachers' assessment practices. Assessment serves teaching, and its purpose is to enhance teaching. The proper utilization of teaching evaluation strategies can enhance the quality of education and teaching, as highlighted by Pan [13].

In conclusion, the discussion underscores the need for a shift from traditional teaching evaluation methods to embrace innovative, practice-based approaches. Prioritizing student engagement and individualized assessment can enhance teaching quality and support holistic student development. By integrating systematic

evaluation knowledge and fostering a culture of continuous improvement, educators can adapt to diverse learning needs and promote effective teaching practices, ultimately fostering student success in today's educational environment.

Table 10. Relationship between teaching pedagogy and assessment practices of teachers

		rho-value	*P*-value	Interpretation
Teaching method knowledge	Usage of assessment tools	0.714**	0.000	Highly significant
	Assessment strategy	0.684**	0.000	Highly significant
	Approaches or format for assessment	0.595**	0.000	Highly significant
	Data analysis and application	0.714**	0.000	Highly significant
Classroom management	Usage of assessment tools	0.740**	0.000	Highly significant
	Assessment strategy	0.701**	0.000	Highly significant
	Approaches or format for assessment	0.633**	0.000	Highly significant
	Data analysis and application	0.699**	0.000	Highly significant
Teaching innovation ability	Usage of assessment tools	0.794**	0.000	Highly significant
	Assessment strategy	0.792**	0.000	Highly significant
	Approaches or format for assessment	0.702**	0.000	Highly significant
	Data analysis and application	0.791**	0.000	Highly significant
Professional development	Usage of assessment tools	0.771**	0.000	Highly significant
	Assessment strategy	0.763**	0.000	Highly significant
	Approaches or format for assessment	0.662**	0.000	Highly significant
	Data analysis and application	0.782**	0.000	Highly significant

5. Conclusion and recommendation

The study's demographic analysis reveals that the majority of respondents are females aged 21–30, holding Master's degrees, and possessing over 11 years of teaching experience. Additionally, a significant portion of respondents have master's or doctoral degrees, reflecting a high level of educational attainment and competency in subject matter knowledge, teaching professionalism, and technology integration. However, there are variations in professional competence across demographic groups, indicating a need for targeted professional development initiatives.

Diversity is evident in the age distribution of respondents, with substantial representation in both younger and older age groups, suggesting a mix of early-career and experienced educators. While the study does not directly address teaching pedagogy, the demographic profile implies potential variability in instructional approaches and strategies among respondents. Moreover, there is a balanced distribution of gender among respondents, with slight differences in teaching experience, indicating potential variability in assessment practices based on experience levels.

Based on the findings, recommendations are proposed to enhance faculty development and improve teaching pedagogy and assessment practices. These include allocating resources for ongoing training programs, fostering a culture of continuous improvement among teachers, encouraging scholarly research on effective teaching methods, advocating for budget allocations for faculty development initiatives, updating certification standards, ensuring curriculum designs incorporate diverse assessment methods, and conducting further

research on the intersection of professional competence, teaching pedagogy, and assessment practices with other disciplines. These recommendations aim to promote faculty development and improve teaching quality in Chinese colleges.

Disclosure statement

The author declares no conflict of interest

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Analysis of Cultivating Top Innovative Talents in Undergraduate Teaching Reform Under the "Four in One" Model

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Abstract: In the current landscape, cultivating top-notch innovative talents stands as one of the paramount tasks for universities. To attain this objective, undergraduate teaching reform is deemed imperative. Among various approaches, the "Four in One" training model emerges as a prevalent method, aiming to furnish students with a holistic educational experience while nurturing their innovative abilities and critical thinking through the integration of four key components. Commencing from this objective, the integration of general education and professional education development is explored to ensure the seamless implementation of reform and developmental measures.

Keywords: Undergraduate teaching reform; "Four in One"; Cultivation of top-notch innovative talents

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1. Introduction

With the growing demand for top-notch innovative talents from both the country and society, higher education institutions are increasingly focusing on nurturing individuals with innovative prowess and a practical mindset. As a pivotal aspect of higher education reform, undergraduate teaching reform has garnered significant attention within the education sector [1]. To better align with evolving social needs and educational objectives, many colleges and universities have embarked on exploring the "Four in One" training model. This model not only enhances students' professional competence and practical skills but also fosters their innovative mindset, catering to their developmental needs [2]. This article aims to analyze the implementation of the "Four in One" training model, undertake reforms in undergraduate teaching, and delve into strategies for cultivating top-notch innovative talents. It seeks to explore the feasibility and effectiveness of these methods, offering valuable insights and inspiration for higher education reform.

2. Definition of "Four in One"

The term "Four in One" entails the integration of leadership, strategy, human resources, and operations into

a cohesive system [3]. Within this framework, leadership serves as a foundational element, encompassing organizational leadership style, values, and skills, thus laying a crucial cornerstone for overall development. Strategy assumes paramount importance, delineating the goals and direction of an organization. It should be formulated with scientific precision, considering factors such as market dynamics and competitive trends. Operations constitute vital mechanisms for strategic advancement, encompassing internal processes and systems that serve as the tangible foundation for achieving strategic objectives. Human resources form the bedrock for supporting operations and strategic growth, encompassing talent recruitment, incentives, assessments, and related functions [4]. Establishing a more scientifically driven human resource management system is essential to unlock potential and foster enthusiasm. The strength of the "Four in One" model lies in its adeptness at integrating all facets of the organization, fostering a collaborative and cohesive collective. It underscores the core values of the organization, ensuring not only clear goals and directions but also continuous refinement of operational mechanisms to adapt to market dynamics and challenges.

3. Strategies for cultivating top innovative talents in undergraduate teaching reform under the "Four in One" model

3.1. Adhering to the cultivation of moral character and enhancing students' moral integrity through the "academy system"

Creating an optimal educational environment conducive to student development is paramount in contemporary undergraduate education. Hence, the establishment of a robust educational management model is essential. Efforts should be directed towards fostering an atmosphere conducive to effective general education promotion, innovating within the new talent cultivation reform, and instituting a collaborative "academy system" that integrates both general and professional education. This approach aims to enhance student character development and optimize their overall quality.

The "academy system" represents a novel approach to student management, primarily transforming student dormitories into living and learning spaces within the university. By fostering cohabitation among students from various majors and academic years, the academy system promotes self-management and mutual growth. It bridges the gap between professional training and quality education, thereby cultivating desired behavioral traits and management practices through diverse educational methods. Emphasizing moral character development and cultural enrichment, it instills a robust sense of social responsibility and holistic quality in students.

Departing from the traditional major-based student management model, the academy system fosters a diverse and inclusive environment, encouraging peer learning, inspiration, and broadened perspectives. Additionally, it focuses on nurturing students' social engagement and organizational leadership skills through diverse extracurricular activities and club organizations. By providing strong support through various educational methods and scientific behavior management, the academy system facilitates the cultivation of exceptional talents [5].

To further enhance the academy-based education model and augment students' overall quality, several key explorations have been undertaken. Firstly, universities should establish a novel student development education system aligned with socialist core values, constituting a crucial educational task. Capitalizing on the pivotal first year, universities should offer "Freshman Development Education" courses aimed at elucidating students' four-year growth objectives. Through cultural and spiritual exploration, expert subject reports, inspirational alumni anecdotes, student role models, and functional department initiatives, students can grasp the institution's ethos, discipline, and structure, fostering a sense of belonging and pride.

Promoting patriotism, collectivism, heroism, and optimism emerges as pivotal values in students' growth

trajectory. By organizing patriotic education activities, collectivism lectures, and heroic deeds presentations, students gain insights into their nation's history and culture, enhancing patriotism and collective pride. Secondly, universities must leverage new online media to establish a comprehensive and coordinated education environment encompassing classrooms, dormitories, campus, and off-campus realms, domestic and international spheres, and the virtual world. This enriched environment affords students more opportunities and resources for holistic development, aiding their integration into society and fostering a sense of social responsibility and purpose.

Thirdly, schools should actively promote sports spirit and habit cultivation education, recognizing sports' role in fostering a healthy physique and competitive spirit. Through various sports activities like intercollegiate games and team sports, students imbibe teamwork and competitive consciousness. Simultaneously, attention to habit development, encouraging regular sleep, a healthy diet, and moderate exercise, contribute to students' physical well-being.

Lastly, schools must bolster academic counseling centers and provide professional academic guidance services, comprising student work management, counseling, and part-time counseling teams. Ensuring these teams possess extensive educational experience and professional knowledge enables personalized learning guidance for students. Attention should also be directed towards psychological counseling, academic progress monitoring, and fostering a conducive academic atmosphere. Establishing support systems for underperforming students further promotes comprehensive development in knowledge, skills, and conduct among all students.

3.2. Innovative talent training program: pragmatic learning of basic knowledge for students

In recent years, several universities in China have actively spearheaded the reform of talent cultivation models, amalgamating general education, scientific research training, and innovative abilities within higher education reform [6]. Drawing inspiration from both overseas and domestic top-tier universities, they have instituted a novel talent cultivation plan characterized by hierarchy, personalization, and modularity [7,8]. These reforms aim to fortify students' knowledge foundations, broaden avenues for skill development, and facilitate discussions, top-level design, formulation, and review of various professional talent training programs and curriculum system reforms. These measures are instrumental in enhancing the quality of talent cultivation, aligning with the emerging trends and requisites of higher education reform and development domestically and internationally, while nurturing top-notch innovative talents. Simultaneously, these reforms afford students more opportunities for personalized learning and development, conducive to overall quality enhancement.

Firstly, promoting the integration of relevant professional resources can fully harness and showcase the strengths of various disciplines, while establishing disciplinary and professional risk warning mechanisms for shutdown and transfer. Only through such measures can team building and talent cultivation within disciplines be comprehensively demonstrated, averting issues of duplicate construction and homogenization in disciplines. The reform plan for the national college entrance examination enrollment system and the rollout of the latest undergraduate major catalog in 2020 provide robust support for schools to recruit and nurture students according to major categories. For instance, a university in Liaoning Province has streamlined resource allocation and propelled comprehensive education and teaching reform by consolidating the original 83 majors into 30 disciplines/major categories and 8 experimental classes. This initiative bolsters student application enthusiasm while maintaining the cohesion and correlation between majors and addressing employment dynamics. Implementing this reform measure will bolster teaching quality and enhance schools' competitiveness in employment, offering students a more diversified array of learning options.

Secondly, to better align with societal demands for talent cultivation, traditional educational paradigms need revision, with a focus on enhancing students' comprehensive qualities and foundational abilities, beyond mere professional skills, fostering holistic development. Hence, it is imperative to cultivate exceedingly robust and broad-spectrum talents, emphasizing "basic theories, basic knowledge, and basic skills" as the crux, and devising general education core courses imbued with distinctive characteristics and styles. These courses encompass a diverse array of subject knowledge, including fundamental knowledge of human civilization, alongside relevant basic life and career development skills, thereby constituting mandatory courses for undergraduate students. Ensuring the enduring and foundational role of these courses in students' studies necessitates the exploration and introduction of implementation measures such as "enhancing the quality construction of basic and core courses." In these measures, each professional basic course should establish grassroots teaching organizations helmed by responsible professors (associate professors) overseeing course construction, with a focus on teacher team building, textbook development, online course creation, and experimental and practical teaching design. Concurrently, the teaching organization model of "large class teaching and small class tutoring" should be fully executed for professional basic courses, deploying outstanding teachers for basic course instruction and young teachers or graduate students as teaching assistants. Additionally, professional basic courses should be completely disentangled from teaching and examination, employing third-party propositions for fair and impartial assessment of teaching efficacy.

Thirdly, universities should steer clear of prematurely constraining students' professional choices, a pivotal concern warranting in the present educational landscape. To address this issue, the new training program will realize a coordinated design of the undergraduate, master's, and doctoral integrated curriculum system. This entails a more flexible curriculum design that can be tailored to student's interests and strengths, enabling them to gain a comprehensive understanding of knowledge and skills across various fields of study. This expands students' growth horizons and forestalls the fragmentation and squandering of undergraduate resources. Moreover, the new training program will resolve the mechanism problem of course selection and credit recognition, enabling students to earn credits in different courses, thus better managing their learning progress and time allocation.

Finally, universities should prioritize the quality of first classroom education and comprehensively advance cultural education to foster the development of the five types of classroom education. This constitutes a pivotal measure at present, conducive to enhancing students' comprehensive qualities and professional competence. It is imperative to recognize that the first classroom serves as the primary battleground for knowledge transmission, necessitating the establishment of a suitable system for student development and oversight. This can bolster students' professional literacy and teaching capabilities, enabling educators to cultivate an educational philosophy of "classroom precedes the day." Furthermore, teachers should embrace advanced teaching methodologies such as heuristic, interactive, and flipped approaches to ensure the relevance and engagement of teaching content. On one hand, this fosters active student participation, while on the other hand, it nurtures their interest in learning and innovation aptitude. In the second classroom, emphasis should be placed on cultivating students' comprehensive qualities through the academy, youth league committee, and various student clubs, fostering character and habit development education, and establishing several off-campus practical training bases across science, engineering, medicine, economics, management, literature, and arts, thereby providing students with real-world exposure. This enables students to grasp the practical significance of knowledge. Actively opening up a third classroom for international exchange, encouraging students to partake in learning, internships, and cultural exchanges at world-class universities, research institutions, and enterprises. Leveraging high-quality online education resources such as MOOC and iClass.com as the fourth classroom

empowers students to access resources remotely, enhancing their ability to acquire knowledge and diversifying their learning methodologies.

4. Conclusion

In summary, cultivating top-notch innovative talents through the "Four in One" approach is paramount. Reform and innovation must be undertaken from multiple perspectives to ensure that talents can adeptly navigate the evolving landscape. Through the implementation of reformative and innovative measures, universities can furnish students with a superior educational experience, nurturing their innovative abilities and critical thinking. This, in turn, establishes a robust foundation for their future careers and societal contributions.

Disclosure statement

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Business and Education: PPP Model in Public Education

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Abstract: Currently, many countries are committed to constantly improving the structure of public education service systems, seeking ways to revitalize public education to serve society more effectively. Addressing rational investment in public education is a crucial challenge facing all nations. In recent years, some developed countries have incorporated private businesses into public education, effectively improving the allocation of educational resources and educational efficiency. This paper conducts an in-depth study of Public-Private Partnerships (PPP) in public education, focusing on its implementation and outcomes.

Keywords: Public Private Partnership (PPP); Public education

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1. Introduction

In today's world, many countries prioritize establishing a robust public education service system and enhancing the fairness and inclusivity of education, despite variations in structure, political systems, and welfare levels. The introduction of public-private cooperation into public education has emerged as a potent catalyst for educational reform and development in numerous countries, representing a significant measure to address the challenges facing public education. The Public-Private Partnership (PPP) Model in education represents a novel approach to education investment, financing, and service delivery, garnering increasing attention and influence over time.

This article will critically review the development of "Public-Private Partnership (PPP) in education" within the realm of public education. It is structured into six sections: The connotation of the PPP Model, its origin, advantages and drawbacks, the background of its implementation in public education, types of international public education utilizing the PPP Model, and reflections on the merits and limitations of applying the PPP model to public education.

2. The connotation of the PPP Model

The PPP Model can be defined as a contractual relationship between the government and private businesses

participating in specific projects dedicated to educational development, where costs, risks, and benefits are shared [1,2]. Wang asserted that the PPP Model establishes the rights and obligations of both parties through a contractual agreement, facilitating the provision of public goods based on concession agreements [3]. Consequently, both parties can achieve greater benefits than if they were to act independently.

Essentially, the PPP Model allows the government to initiate projects in response to social demand for public goods and select private enterprise partners through a bidding process. In return for funding, the government entrusts private companies with project implementation responsibilities. Both parties must fulfill their respective obligations within specified timeframes and parameters [4-6]. Thus, as an effective means of joint provision, the PPP model mitigates project risks and enhances project construction, operational efficiency, quality, and standards. PPP projects serve the public interest and are not driven by profit motives. Unlike other forms of transactions, when the government and the private sector share common interests, they also share common risks [7].

3. The origin of the PPP Model

The concept of PPP was first introduced by the United Kingdom. Initially, it served to compensate for the government's limited financial resources in providing certain public goods, thereby enhancing resource utilization efficiency [1,8]. The PPP model has since been widely adopted by international organizations and countries worldwide for various public infrastructure projects, including education, national defense, transportation, waste treatment, healthcare, and housing, particularly gaining traction after the 1990s. In 1992, Norman Lamont, serving as the Chancellor of the Exchequer, spearheaded the Private Finance Initiative (PFI), marking the inception of modern society's first public-private partnership project embodying the essence of PPP. This initiative was pivotal in further fostering collaboration between government entities and private sectors.

4. Advantages and drawbacks of the PPP Model

The PPP model is regarded as an investment, construction, and management approach that effectively addresses inefficiencies in government operations and market failures [9]. Du's research summarized the advantages of the PPP Model in the modern era, highlighting its ability to alleviate government financial pressures, facilitate risk sharing, diversify investment channels, and expedite change, reform, and development. Malone [4], along with Regan and colleagues [10], underscored the model's influence in achieving higher economic and time efficiencies, enhancing the quality of public services and infrastructure, expanding infrastructure investment sources, and enabling long-term planning by both public and private sectors.

However, drawbacks exist. The complexity of the process may lead to inefficiency, and misalignment of goals between public and private entities, as well as unequal bargaining power, are concerns [3,11]. Trebilcock and Resenstock discussed additional drawbacks, such as high financing costs for the private sector, potential monopolization through franchising, increased public service costs, and limited flexibility in long-term contracts [6].

5. The background of the PPP Model in public education

Public education is a complex issue intertwined with society and politics, primarily serving public interests and affairs [9]. Historically, governments have directly constructed public schools to uphold the public nature

of education. However, evolving societal norms and concepts are challenging with the traditional government-led approach to school construction, supervision, and management [11]. Critics argue that this model fosters rigid school organizations lacking in flexibility, while state monopoly over education has stifled competitiveness across various industries, resulting in diminished incentives for schools to improve teaching quality and efficiency. Consequently, significant social resources have been squandered, exacerbating governmental financial burdens [5]. For example, Du observed that most colleges and universities in China receive government funding, ostensibly ensuring relative equity in higher education [7]. However, the suboptimal utilization of educational resources persists due to factors such as unrealistic student enrollment expansions, flawed management systems, and a disproportionate emphasis on infrastructure development.

Furthermore, the PPP model has gained traction in public education beyond developed nations, with countries like India, Pakistan, and various African nations also embracing it to address educational funding and resource challenges [12]. In the context of public education, PPP entails collaboration between government and private sectors to deliver high-quality, efficient education services [2]. Patrinos provided insights into the benefits of introducing the PPP financing model to public education, highlighting its potential to mitigate inadequate education investment, enhance resource utilization, diversify funding sources, and catalyze education development and transformation [8].

6. Types of international public education with the PPP Model

In recent decades, the PPP model has found widespread application in public education in Western countries. Successful examples include the PFI for education in the U.K., the public school with the private model in the U.S., the Australian educational facility cooperation model, and the education service and procurement model in New Zealand. Connolly *et al.* provided a detailed overview of PFI, a typical public-private partnership for school infrastructure projects implemented in the UK in 1992. Under this initiative, the private sector constructs education infrastructure according to specified standards, with the government paying for education services under specific conditions. Ownership of the infrastructure is jointly held by the local education authority and the private sector during the concession period, during which the private sector is responsible for operation and management. Ownership is then transferred back to the education authority after the concession period, with the private sector bearing most of the risks involved in building educational institutions for the government [13].

LaRocque categorized public education into seven types [14]:

(1) The Charity Action Plan of the Private Sector: Involves private charities donating funds to support public education, enhancing the quality of education in public schools, and assisting children from low-income families.

(2) Government Purchase Action Plan: Involves the government and private schools providing educational services through contracts funded by public funds.

(3) School Capacity-building Action Plan: Private partners provide teacher development plans, including training and curriculum development.

(4) School Operation Action Plan: Education authorities contract directly with the private sector to manage public school operations while the schools remain public or aided.

(5) School Assistance and Adoption Plan: Private partners provide financial and material resources to supplement government funding for public schools.

(6) School Infrastructure Action Plan: Private sectors invest in, construct, and operate public school infrastructure under long-term contracts with the government.

(7) Voucher and Imitation Voucher Action Plan: Governments subsidize students to attend private schools.

Yuan and Shan classified these models into two types based on partnership differences and participant roles: the PPP Model of Education Contract and the PPP Model of Stakeholder Education Partnership [15]. The PPP Model of Education Contract involves the public sector organizing system arrangements for private sector participation in public education. Both parties define their obligations and rights through legally valid contracts, aiming to increase the supply of public education and improve education service quality. For example, the education service procurement plan of New Zealand's public education department signs agreements with the private sector, which provides educational resources and services to meet specific educational needs [16]. In contrast, the PPP Model of Stakeholder Education Partnership entails cooperation between the public sector and private partners to achieve common goals or complete specific missions. Participants may have different objectives, such as resource sharing or standard process formulation, based on societal responsibilities. Unlike the PPP Model of Education Contract, the private sector in the PPP Model of Stakeholder Education Partnership may not gain private benefits [16].

7. The merits and reflections of the PPP model applied to public education

7.1. The superiority of the PPP model in public education

The application of the PPP model can expand the ways of raising funds for public education. Both LaRocque's study and Robertson and Verger's study expounded on how the PPP model largely alleviates the financial burden of the public education department and establishes a relatively fair use and supervision system of education funds to maximize their efficiency [9,14]. It introduces the private sector to fully realize its resource allocation function in the market. Additionally, the PPP model helps improve the working efficiency of public departments by encouraging private departments to exert their economic effects in infrastructure construction and management, thereby shortening project cycles [6]. Moreover, the unique barriers in the field of education are broken down, providing more vitality and attraction to the entire industry [17].

7.2. Issues worth noting in the application of the PPP model in public education

Establishing a benign partnership between the public and private sectors is crucial. The relationship between public and private departments, as well as the quantity and quality of education, should be carefully handled. Tang proposed that formulating reasonable policies lays the institutional foundation for creating good environments and improving the application abilities of partnerships [11]. It is necessary to comprehensively consider all aspects of education provision. Only in this way can the service scope be enlarged and the quality of education be maximized [17].

Public education needs to incorporate active and effective private education components in financing and management. These components include non-profit schools, for-profit schools, community schools, and so on [18]. The government cannot unilaterally provide adequate funding for education. Practices of public education under PPP models in many Western countries have proven that multiple educational service institutions have obvious advantages over single education service institutions.

Disclosure statement

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PBL-Based Vocational Education Blended Learning Activity Design Research

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Abstract: There are disparities between vocational education personnel training and industrial development. The purpose of this research is to develop a PBL-based blended learning activity design aligned with vocational education talent training goals, leveraging the benefits of project-based and mixed learning approaches. The design encompasses problem clarification, goal determination, problem design, problem-solving, results display and evaluation, and summary activities. Employing a quasi-experimental research methodology, this study was conducted in the core course "Software Development Technology" within the software technology major of Vocational College X. Through comparative data analysis between the experimental and control groups, it was observed that students in the experimental group demonstrated varying degrees of improvement in their abilities related to demand analysis, software design, software development, and software testing in the field of software development technology. This finding affirms that PBL-based blended learning activities can effectively enhance students' technical skills by extending learning opportunities in both space and time, thereby offering practical insights for vocational education talent training research.

Keywords: Blended learning; E-learning; Information technology

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1. Introduction

Vocational education, an integral component of the education system, is tasked with the mission of cultivating a diverse workforce. China's latest Vocational Education Law explicitly emphasizes the equal importance of vocational education alongside general education. Presently, vocational education not only offers a wide array of specializations but also demonstrates increasing sophistication across secondary, advanced, and undergraduate levels. However, there appears to be a discrepancy between vocational education and the societal demand for skilled labor, failing to adequately fulfill enterprises' requirements for vocational talents. This issue stems from a lack of true implementation of vocational education personnel training objectives in the educational process. This neglect is evident in the continued reliance on traditional classroom lectures supplemented by practical training and internships, with curriculum assessments primarily relying on exams and tests.

In essence, vocational education aims to equip individuals with the vocational knowledge, skills, and

cultural understanding required for high-quality technical and skilled personnel in specific occupations [1]. Thus, innovating teaching modes and methods to enhance teaching quality is paramount for the successful execution of high-quality technical skills personnel training in vocational education.

This study harnesses the omnipresence of online learning and the collaborative nature of extracurricular learning in vocational education to propose blended learning based on Problem-Based Learning (PBL). It merges the attributes of PBL and blended learning, leveraging the advantages of both online and offline, and in-class and extracurricular learning. By guiding vocational education to identify real-world problems in teaching and learning, this approach emphasizes core knowledge themes and facilitates collaborative problem analysis and exploration within groups. Learning outcomes are showcased and evaluated through works, culminating in a teaching and learning endeavor that nurtures technical talent in vocational education.

Through the implementation and evaluation of blended learning activities in vocational education grounded in PBL, this study seeks to introduce fresh perspectives and chart new pathways for cultivating high-quality technical and skilled talent in vocational education. It also aims to foster synergistic development between vocational education and industry.

2. PBL-based blended learning activity design for vocational education

2.1. Design basis

PBL centers on real-world problem inquiry, wherein students, organized into teams, undertake a series of activities including design, planning, problem-solving, decision-making, creation, and presentation of results. This approach aims at fostering knowledge construction and enhancing abilities [2]. The model aligns with Jerome Seymour Bruner's theory of discovery learning, John Dewy's pragmatic theory of education, and Robert Jeffrey Sternberg's constructivist theory of learning. Its focus on real-world problems and unique teaching methods align well with the demand for talent in the new era and the developmental trajectory of vocational education toward nurturing high-quality technical and skilled talents [3].

Blended learning, also known as "fusion learning," encompasses various perspectives in the 21st century's rapidly evolving digital landscape. Reed *et al.* argued that blended learning involves the strategic utilization of appropriate learning methods, media, timing, and content to maximize learning efficiency [4]. Picciano defined blended learning as the integration of multimedia technology with traditional classroom practices [5]. British scholar Thorne suggested that blended learning integrates digital and traditional teaching methods, catering to students' personalities and needs [6]. Bonk and Graham, in the "Handbook of Blended Learning: Global Perspectives, Local Designs," described blended learning as a fusion of face-to-face instruction and online teaching, requiring teachers to adapt to diverse teaching contexts, environments, and student needs, while crafting instructional designs [7].

Hence, the scientifically and systematically designed blended learning activities based on PBL hold significant practical importance for innovating teaching modes and methods and implementing high-quality technical and skilled personnel training. Whether it involves discovering, analyzing, and resolving real-world problems in vocational education or collaborating to complete learning outcomes and evaluate displays, blended learning grounded in PBL fosters immersive problem-solving experiences within group settings. Consequently, theories such as discovery learning, pragmatism in education, and constructivism in learning offer valuable foundations and perspectives for the design of blended learning activities based on PBL.

2.2. Activity design

A learning activity encompasses the collective actions of both teachers and students aimed at accomplishing

designated learning objectives [8]. The design of blended learning activities based on PBL in vocational education entails comprehensive planning of the teaching and learning process, serving as the foundation and assurance for subsequent activity implementation. Aligned with the goals of vocational education talent cultivation and PBL characteristics, the process of PBL-based vocational education blended learning activities is illustrated in **Figure 1**. This process involves identifying the theme, defining objectives, formulating a plan, problem-solving, communicating results, and evaluating and summarizing outcomes. The specific execution of these activities can take various forms, including entirely face-to-face instruction, fully online instruction, or a blend of online and offline modalities [9]. However, it necessitates support from online learning resources such as Massive Open Online Courses (MOOCs) and online teaching platforms, as well as network technologies like 5G, augmented reality (AR), and virtual reality (VR) technologies.

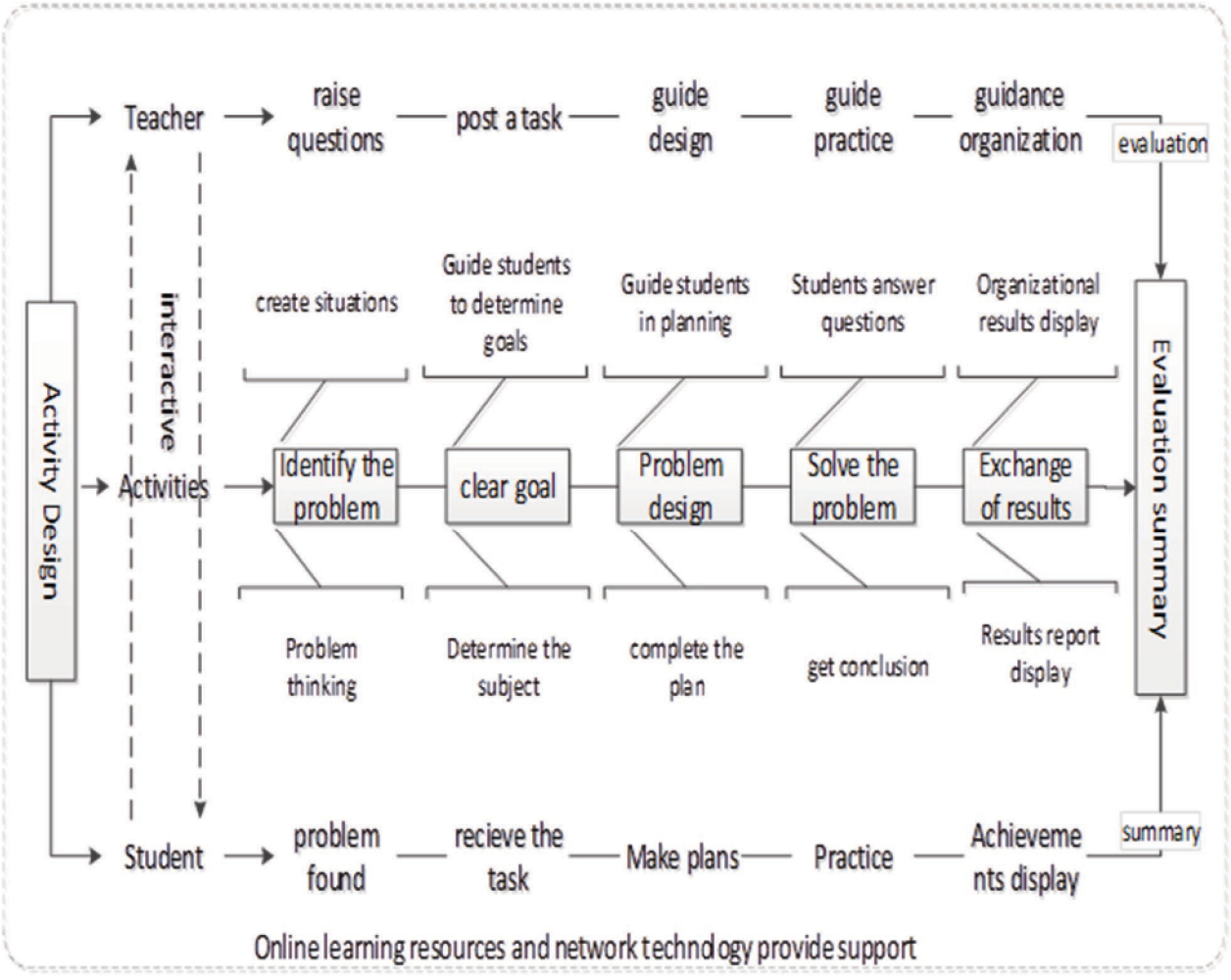


Figure 1. BPL-based blended learning activity design for vocational education

3. Applied practice of blended learning activity design based on PBL

To ascertain the effectiveness of PBL-based blended learning activity design in vocational education, this study was conducted during the spring semester of 2023, implementing the core course "Software Development Technology" in the software technology program at Vocational College X.

3.1. Study design

Experimental subject: The experimental group comprised the students of Big Data Technology Class 1, Grade 2021, while Big Data Technology Class 1, Grade 2020, served as the control group. It was anticipated that the professional skills of the experimental group would improve in their core course of "Software Development Technology" during the second semester of the software technology major following the implementation of blended learning activities based on PBL.

Experimental design: This study employed a quasi-experimental research method, utilizing post-tests for both the control and experimental groups to analyze whether students' professional knowledge, skills, and professionalism improved, thus validating the effectiveness of blended learning activities based on PBL. The independent variable was PBL-based blended learning activities, while the dependent variable was software development technical skills in the software technology program. Each group consisted of 50 students, and both groups were instructed by the same teacher. The independent variable was applied to the experimental group to facilitate the analysis of differences between the two groups' software technology students regarding software development technical skills.

Before the course commenced, a questionnaire was administered to collect data on the software development technical skills of students in the control group. Four project-based learning activities – requirements analysis, software coding, software development, and software testing – were incorporated into the teaching of the experimental group, as outlined in **Table 1**. The course adopted a format of offline face-to-face instruction for 2 hours per week, supplemented by online learning services through the "Super Star" cloud classroom outside of class. Random interviews were conducted at the conclusion of each project, and questionnaires were employed to assess and analyze the experimental group's students' skills in software development technology at the end of the course. Finally, the effectiveness of PBL-based blended learning activities in enhancing the software development technical skills of software technology students was verified through a comparison of questionnaire survey results between the experimental and control groups, alongside an analysis of interview content and completion of project activities by the experimental group.

Table 1. Design of the course project

Project name	Project goal	Project result demand
Requirements analysis	Solve the problem of "what to do", that is, analyzing and organizing the information described in the user requirements to form a complete, clear, and standardized description of the document.	Be able to fully identify user requirements and standardize the preparation of the "User Requirements Specification."
Software design	Solve the problem of "how to", that is, obtaining a feasible, high-quality software solution that meets the needs of the software.	Be able to standardize the preparation of "the Outline Design Specification" and "Detailed Specification."
Software coding	Solve the problem of "how to deal", that is, completing the program design and code writing of the software.	Be able to develop software that is consistent with the description in the User Requirements Specification (URS).
Software testing	Solve the problem of "how is it done", that is, completing the testing of the software.	Be able to standardize the preparation of the "Test Report."

Measuring tools: Questionnaires were developed for both the experimental and control groups to assess their technical skills in software development. The content tailored for the experimental group specifically emphasized the four programs, including the Student Outcome Assessment Scale (SOSA).

3.2. Study results

Through qualitative analysis of the interviews and course outcomes of students in the experimental group, along

with quantitative comparative analysis of questionnaire data from the control group, this study found that the software development technical skills of students in the software technology major within the experimental group have improved to varying degrees. The specific changes are as follows:

3.2.1. Firming of professional belief in software development

In post-course interviews, Student A remarked, "PBL-based blended learning makes the software development technology course engaging and enriching, strengthening my confidence and determination to pursue a career in software development after graduation." Student B commented, "The four projects provided me with a more comprehensive understanding of software development work, and I truly appreciate the effectiveness of PBL." Student C stated, "Software development is inherently a collaborative endeavor. Through project presentations and evaluations, I have gained a deeper understanding of the importance of communication and collaboration in team development processes." The survey and qualitative analysis of software development technology learning outcomes revealed that "technology," "ability," and "communication" were the most prominent aspects. This suggests that students majoring in software technology have acquired a more comprehensive mastery of software development technology skills through this course.

3.2.2. Enhanced professional knowledge in software development

According to the system development cycle theory, software development typically involves four stages: requirements analysis, software design, software coding, and software testing [10]. Building upon this framework, the study conducted a mean value analysis of expertise mastery using questionnaire and evaluation data from both experimental and control groups, as illustrated in **Table 2**. The analysis indicates that students in the experimental group exhibited positive changes in all four dimensions of software development expertise mastery.

Table 2. Test difference in software development knowledge

	Experimental group		Control group		*P*-value
	Mean	Std dev	Mean	Std dev	
Requirements analysis	8.32	1.085	7.54	1.299	0.002
Software design	8.2	1.131	7.32	1.849	0.005
Software coding	8.14	1.183	7.52	1.723	0.041
Software testing	8.28	1.184	7.62	1.528	0.010

To further comprehend the significance of the four knowledge changes, this study conducted a difference test on the two sets of data. Among them, the *P*-value for the requirements analysis dimension was found to be 0.002. This indicates that through blended learning based on PBL, the requirements analysis knowledge of students in the experimental group has been significantly enhanced, while the improvement in software coding knowledge is also notable. The primary reason for the relatively less significant change in software coding knowledge is that the design of software coding activities necessitates students to possess a certain level of prior knowledge, thus the changes through blended learning activities based on PBL are comparatively moderate. Software requirements analysis is intricately linked to the teaching of software development technology courses. Within the course, students encounter numerous opportunities to engage with design examples from information technology courses and undertake innovative designs, hence leading to a significant improvement in software requirements analysis. Software testing, being closely associated with the preceding three activities,

benefits from the plethora of reference resources provided by the online teaching platform, resulting in noticeable improvements in software testing.

3.2.3. Enhanced professional competence in software development

In accordance with the professional ability requirements of software development roles, individuals are expected to possess technical ability, problem-solving ability, independent learning ability, and communication and collaboration skills [11]. Based on this premise, the study analyzed the self-evaluation mean values of the four professional competencies, as depicted in **Table 3**. The mean values of competencies such as technical ability, problem-solving ability, and independent learning ability have all increased to varying degrees.

Table 2. Test of difference in software development knowledge

	Experimental group		Control group		*P*-value
	Mean	Std dev	Mean	Std dev	
Technical ability	8.58	1.234	8.02	1.490	0.045
Problem-solving ability	8.32	1.207	7.56	1.899	0.019
Independent learning ability	8.72	1.078	7.7	1.735	0.001
Communication ability	8.46	1.203	7.76	1.594	0.008

Based on the mean values of self-assessment for the four professional competencies, this study conducted a difference test between the experimental and control group data for each competency to further analyze the significance of the changes. The *P*-values for students' technical competence, problem-solving competence, independent learning competence, communication competence, and software development competence as a whole were found to be 0.045, 0.019, 0.001, 0.008, and 0.18, respectively. These results indicate a significant improvement in these four competencies among the students.

Through the course, PBL-based blended learning practices were employed, providing students with access to a wide range of online learning resources for software development, including targeted and self-directed selective learning and software development case references. Additionally, class discussion groups and forums were established within the "Super Star" cloud classroom platform, with students' participation frequency in discussions being one of the evaluation criteria for the course assessment. As a result, noticeable improvements were observed in students' technical skills, problem-solving abilities, independent learning capabilities, and communication and collaboration skills.

3.2.4. Expanded learning time and space for software development

PBL-based blended learning encourages students to engage in activities such as problem clarification, team division of labor, problem design, investigation, and results presentation through the "Super Star" cloud classroom platform, both inside and outside the classroom. This approach fully leverages the advantages of "online + offline" learning, departing from the limitations of traditional teaching where teacher-student interactions are confined to the classroom. Consequently, learning time and space have been effectively extended. Therefore, the ability to independently learn from online resources is deemed essential for students' professional competencies. Furthermore, through interviews with students in the experimental group, it was revealed that the majority found blended learning activities, both online and offline, to make their learning experience more convenient.

In summary, the analysis of experimental results indicates that the students in the experimental group

have demonstrated varying degrees of improvement in their software development technology, specifically in requirements analysis, software design, software coding, and software testing abilities. Thus, it can be concluded that the implementation of blended learning activities based on PBL enhances students' technical skills by breaking through traditional constraints in learning time and space.

4. Conclusion

Innovation in teaching methods and approaches within vocational education is not only essential to meet the inherent demand for talent training but also crucial for the advancement of vocational education in nurturing technical and skilled individuals. This study validates the effectiveness of PBL-based blended learning activities in enhancing the technical skills of vocational personnel. It is important to note that prior to conducting these activities, suitable online learning resources and technologies are necessary to provide teaching support. Throughout the activities, leveraging the course assessment and evaluation mechanism is imperative to incentivize student engagement in course learning and group collaboration and communication during extracurricular time. Following the conclusion of these activities, teachers can guide students in optimizing or improving course outcomes, encouraging active participation in relevant skills competitions or social practice activities to further solidify their professional knowledge and enhance their professional and technical skills.

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A Study on the Identity, Cross-Cultural Management Behavior and Career Adjustment Path of Foreign Student Counselors in China Based on Social Role Theory

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Abstract: Counselors for international students are not only professional identities but also social roles, encompassing counselors' professional responsibilities and expectations, international students' needs and expectations, as well as the influence of social and cultural environments. Under the guidance of social role theory, this paper first analyzes the current status quo of the identity of foreign student counselors in China and discusses the role conflicts and related work difficulties faced by this profession. Secondly, it explores the relationship between foreign student counselors' understanding of their careers and their cross-cultural management behavior. Finally, the paper puts forward suggestions for strengthening the relevant system guarantees and providing platform experiences from the perspective of the state to the universities. Additionally, it proposes suggestions for self-empowerment from the perspective of the practitioners, offering a new path to the high-quality development of international students' education.

Keywords: Counselors for international students in China; Social role; Identity; Career adjustment; Cross-cultural communication

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1. Introduction

The profession of international student counseling specializes in managing students studying abroad in the era of globalization. In 2017, the Administrative Measures for School Recruitment and Training of International Students, jointly issued by the Ministry of Education, the Ministry of Foreign Affairs, and the Ministry of Public Security of China, first proposed the establishment of the position of "International Student Counselor" [1]. This initiative has significantly influenced the creation of a conducive international teaching and research environment, the promotion of overseas education in China, and the dissemination of Chinese culture abroad [2]. Consequently, it is imperative for colleges and universities to establish and enhance the workforce of full-time counselors for international students. This is not only a necessary measure for the internationalization of higher education

institutions but also an essential guarantee for promoting the high-quality development of international education.

The identity of counselors for international students in China transcends being merely professionals who assist international students in adapting to campus life and academics; it represents a multidimensional and complex concept. However, the professional recognition of international student counselors remains low. Many universities in China have yet to establish full-time and part-time counseling positions for international students, and this role lacks relevant industry standards and recognition mechanisms [3]. Consequently, the value pursuits and behaviors of international student counselors are driven by institutionalized needs for survival and development, preventing them from establishing a comprehensive professional identity. This, in turn, hinders their ability to provide high-quality services and diverse support to international students.

Therefore, guided by social role theory, this paper analyzes the various dimensions of the identity concept of foreign student counselors in China and explores counselors' cross-cultural management behavior. Subsequently, it proposes a constructive adjustment path for this profession.

2. Analysis of the identity dilemma of foreign student counselors in China based on social role theory

The concept of counselors for foreign students in China encompasses a complex professional identity, and the degree of social recognition of this identity is closely linked to their effectiveness in professional roles. According to social role theory, society functions as a grand stage where individuals assume various roles. Fulfilling the rights and obligations associated with a particular status constitutes playing a role [4]. Delving into the role expectations, conflicts, and commitments encountered by international student counselors during their work aids in revealing the nature and impact of their identity dilemmas [5].

Role expectations entail the various requirements and anticipations imposed on individuals' attitudes and behaviors based on societal role norms. The role expectations placed on international student counselors are diverse; they are expected to fulfill roles such as administrators, educators, friends, and cultural liaisons. Their responsibilities include facilitating international students' adjustment to new environments, providing guidance on academic and personal matters, advocating for students' rights, and fostering cross-cultural exchanges [6]. Consequently, the breadth of responsibilities and workload for international student counselors in China is substantial. They must address not only issues similar to those encountered by counselors for Chinese students but also navigate the challenges of cross-cultural communication. Without a fair distribution of workload or adequate support, the profession may struggle to fulfill its potential.

Role conflict arises when individuals must reconcile conflicting obligations associated with multiple roles. In China, international student counselors simultaneously assume the roles of counselor, manager, and service provider, leading to inherent conflicts [7]. While the managerial role necessitates enforcing school regulations and ensuring student safety and well-being, these responsibilities may seem restrictive to international students. Thus, counselors must expend additional effort in elucidating the importance of rules and regulations to foster student compliance. Moreover, as service providers, counselors must assist international students with various issues, ranging from accommodation to cultural integration [8]. However, an excessive focus on service provision may impede effective student management, thereby compromising school efficiency. Striking a balance between managerial and service roles and implementing measures to mitigate role conflicts poses a common challenge for international student counselors.

Regarding role commitment, international student counselors in China serve as primary points of contact for students adjusting to Chinese culture, living conditions, and academic settings. They are committed to

facilitating students' integration and providing essential guidance and support for personal development. However, there exists an imbalance between the efforts invested and the outcomes achieved in fulfilling these commitments. Given the diverse needs and abilities of international students, coupled with language and cultural barriers, counselors expend significant time and energy in understanding and addressing students' concerns [9]. Moreover, the complexity of issues facing international students, spanning societal, national, and institutional domains, complicates the problem-solving process, adding to counselors' burden.

Despite the intricate professional identity associated with their role, international student counselors in China remain inadequately recognized in society, leading to an identity dilemma. Firstly, their work is often constrained by organizational evaluation mechanisms that fail to account for the unique challenges of counseling international students [10]. Consequently, counselors are pressured to conform to evaluation criteria designed for counseling Chinese students, neglecting the distinct needs of international students and hindering their ability to fulfill their professional roles effectively. Hence, there is a pressing need for tailored evaluation and incentive mechanisms to enable counselors to better serve their roles and responsibilities. Secondly, schools or departments provide insufficient support to international student counselors, neglecting to furnish essential resources and opportunities for professional development, such as training and cross-cultural communication initiatives [11]. As a result, counselors struggle to meet students' needs and expectations. Schools and departments must allocate more resources and support, including training and cross-cultural communication opportunities, to enhance counselors' professionalism and service quality [12].

3. Understanding the role of foreign student counselors and their cross-cultural management behavior

Social role theory posits that individuals' behavior and attitudes are shaped by the social roles they inhabit. As cross-cultural managers, foreign student counselors in China encounter the role commitment conflict stemming from cross-cultural communication barriers. Given the prevalence of cross-cultural interactions in their work, encountering communication barriers is inevitable. The understanding of their social roles significantly influences their cross-cultural management behavior when interacting with foreign students.

Firstly, individuals' internal cognition of their identity and role significantly impacts foreign student counselors' attitudes and behaviors in cross-cultural communication. In their role as facilitators of international students' adaptation to Chinese cultural environments and problem solvers in academic, personal, and mental health matters, counselors require cross-cultural communication skills and awareness. Effective recognition of their role orientation and proactive acquisition of cross-cultural communication knowledge and skills enable counselors to fulfill their roles more effectively.

Secondly, the organizational expectations and requirements placed on counselors influence their behavior in cross-cultural management. The identity and role of foreign student counselors in China shape their cross-cultural management practices. As cross-cultural managers, counselors must possess cross-cultural sensitivity, cultural adaptability, and problem-solving abilities. Mindful communication, attitudes, and behaviors during interactions with international students help prevent misunderstandings and conflicts, fostering trust and rapport.

Finally, external perceptions and evaluations impact the career development of foreign student counselors in China. Others' expectations and evaluations of counselors influence their cross-cultural management effectiveness. By fulfilling their roles and responsibilities, building trust, and providing appropriate support, counselors enhance cross-cultural adaptation and development among international students. This, in turn, boosts counselors' self-efficacy and sense of accomplishment.

4. The adjustment path of role conflict and cross-cultural management obstacles of foreign student counselors in China

From the perspective of social role theory and cross-cultural communication, it is evident that international student counselors currently grapple with increasingly pronounced role conflicts and cross-cultural management barriers. To promote and ensure the professionalization and vocationalization of international student counselors in colleges and universities, it is imperative to address these issues through appropriate adjustments and focal points.

Firstly, optimizing the performance appraisal, training, and promotion system for international student counselors is crucial to providing a robust institutional framework for their growth and development. The imperfect career development system for foreign student counselors in China is the root cause of role conflicts, as their work has long been expected to conform to the standards of general counselors [13]. Therefore, the Ministry of Education, provincial education departments, and universities should establish a comprehensive, multi-faceted, and three-dimensional security system. This may involve implementing work management measures tailored to foreign student counselors in China, specifying responsibilities and workload calculation methods [14], diversifying avenues for recognizing outstanding performance, establishing a robust performance reward and punishment mechanism, and updating evaluation criteria to align with the unique context of foreign student counseling in China. Legalizing and institutionalizing the construction of international student counselors promotes their integration into the larger ideological and academic workforce, optimizes their assessment, and fully mobilizes their enthusiasm and initiative to advance internationalization and high-quality development.

Secondly, leveraging the advantages of internationalization platforms is vital for enhancing the ideological refinement, political acumen, practical skills, and professional training of counselors for international students in China. Given the specialized, diverse, and multi-level nature of their occupation and clientele, utilizing the Ministry of Education's and local colleges' internationalization projects and platforms is essential. This may involve utilizing Sino-foreign cooperative education projects for counselor exchanges and learning from successful education and management models abroad. Additionally, capitalizing on domestic and international academic exchange opportunities, organizing professional development activities, and inviting experts to share relevant experiences can enrich counselors' international perspectives, professional knowledge, and cross-cultural communication abilities [15].

Thirdly, counselors for international students in China should actively reshape their role concepts and pursue self-empowerment for career development and job performance enhancement. To effectively mitigate role conflicts and cross-cultural communication barriers, practitioners must address subjective factors. This involves adjusting self-awareness, integrating into the work environment, cultivating professional satisfaction, and overcoming existing professional challenges through role literacy, skill enhancement, and self-empowerment. Self-empowerment encompasses cognitive, emotional, action-oriented, and demand-driven aspects. Continuous learning, exploration, and reflection improve cognitive abilities, while empathy, patience, and mentorship foster emotional connections with international students [16]. Taking timely actions to address students' needs and challenges demonstrates action ability, while actively seeking solutions to problems encountered by international students demonstrates a commitment to their well-being. Only through active self-empowerment can counselors effectively address the complexities of international student education in China.

5. Conclusion

As counselors of international students grapple with challenges such as severe role conflicts and cross-

cultural management barriers, it is imperative for relevant departments, from the national level to universities, to prioritize the career and professional development of these counselors. Efforts should focus on enhancing the profession's identity, bolstering institutional support, and providing training platforms. Counselors for international students in China must also comprehend their social roles and responsibilities fully. They should cultivate their cross-cultural communication skills, actively seek opportunities to enhance their cross-cultural management abilities and empower themselves to assist international students in better adapting to and integrating into new cultural environments. International student education plays a pivotal role in higher education's international cooperation and exchange [17]. Collaboration is essential to provide robust talent and logistical support for the high-quality development of international student education and international education as a whole.

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Influence of Physical Education Courses on Soft Skills Development of College Students Under the Concept of Outdoor Education

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Abstract: In recent years, there has been increasing attention on the development of soft skills among college students. This study aims to explore the influence of physical education courses on the development of soft skills, particularly under the concept of outdoor education. A qualitative research approach was adopted, involving interviews and observations of college students who participated in outdoor physical education courses. The results indicate that outdoor education in physical education courses can effectively enhance college students' soft skills, including communication, teamwork, leadership, problem-solving, and adaptability. The findings highlight the significance of incorporating outdoor education into the physical education curriculum to foster students' holistic development.

Keywords: Physical education courses; Soft skills development; College students; Outdoor education

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1. Introduction

In recent years, there has been increasing attention on the development of soft skills among college students. Soft skills refer to a set of interpersonal and communication skills that are essential for individuals to succeed in their personal and professional lives [1]. Various educational programs and initiatives have been introduced to enhance the development of soft skills among college students.

This study aims to explore the influence of physical education courses on the development of soft skills, particularly under the concept of outdoor education. Physical education is an integral part of the college curriculum, with the primary goal of promoting physical fitness and overall well-being. On the other hand, outdoor education emphasizes experiential and hands-on learning in natural environments. By combining these two concepts, it is expected that physical education courses under the concept of outdoor education can provide a unique and effective platform for the development of soft skills among college students.

Understanding the concept of outdoor education and its role in enhancing soft skills is crucial for the

effective integration of this approach in physical education courses. This paper explored the relationship between physical education and outdoor education and highlighted the importance of incorporating outdoor education into the college curriculum. Furthermore, case studies and examples were discussed to illustrate how physical education courses under the concept of outdoor education have positively impacted the development of soft skills among college students.

2. Exploration of the concept of outdoor education

2.1. Understanding physical education and outdoor education

Physical education is a vital component of the educational system, aiming to promote students' physical fitness, health, and overall well-being. It involves various activities that enhance physical abilities, such as sports, exercise, and games. On the other hand, outdoor education focuses on experiential learning in a natural environment. It aims to provide students with opportunities to develop life skills, environmental awareness, and personal growth.

Outdoor education in physical education courses combines the principles and practices of both physical education and outdoor education. It incorporates outdoor activities and adventure-based experiences to enhance students' learning and personal development [2]. These activities often take place in natural settings such as forests, mountains, or beaches, allowing students to interact with nature and gain a deeper understanding of their surroundings.

The integration of outdoor education into physical education courses offers unique benefits to students. Firstly, it provides a break from traditional classroom settings, allowing students to engage in hands-on and experiential learning. This type of learning fosters a sense of exploration, curiosity, and self-discovery, enabling students to develop problem-solving skills and critical thinking abilities.

Furthermore, outdoor education promotes physical fitness and healthy lifestyles among college students. By engaging in physical activities in natural environments, students can improve their physical fitness levels, strength, endurance, and other motor skills. This not only contributes to their physical well-being but also enhances their mental and emotional well-being.

Outdoor education in physical education courses promotes teamwork, communication, and social interaction. When participating in outdoor activities, students often need to work together, communicate effectively, and rely on one another to achieve common goals. These experiences encourage the development of interpersonal skills, cooperation, and leadership abilities.

2.2. Role and importance of outdoor education

Outdoor education plays a crucial role in the development of college students' soft skills. It provides a unique learning environment that promotes experiential learning and personal growth. Outdoor education offers opportunities for students to step out of their comfort zones and engage in hands-on experiences. Through various outdoor activities such as team-building exercises, camping trips, and adventure challenges, students are exposed to unfamiliar situations that require them to adapt and think creatively [3]. This fosters their problem-solving and adaptability skills, as they learn to overcome obstacles and navigate through unpredictable circumstances.

Outdoor education encourages collaborative learning and teamwork. Many outdoor activities require participants to work together to achieve common goals. For instance, students may need to collaborate to build a shelter or solve a complex navigational challenge [4]. By working together, students develop their communication and teamwork skills as they learn how to effectively communicate their ideas, listen to others'

perspectives, and make collective decisions.

Outdoor education provides opportunities for students to develop leadership skills. Students are often given the chance to take on leadership roles during outdoor activities, where they are responsible for guiding and motivating the group. This experience allows them to develop their leadership qualities and learn how to effectively lead a team towards a common objective.

Outdoor education promotes self-awareness and self-confidence. Through various activities, students are challenged both physically and emotionally, which helps them build resilience and self-esteem. They learn to push their boundaries and discover their own strengths and weaknesses, gaining confidence in their abilities.

3. The impact of physical education courses on the soft skills development of college students

3.1. Definition of soft skills

Soft skills, also known as non-technical skills or transferable skills, refer to a set of personal attributes and abilities that enable individuals to effectively interact with others and navigate various social and professional situations. These skills are crucial in the workplace, as they complement technical skills and contribute to overall success and personal development.

Soft skills encompass a wide range of abilities, including communication, teamwork, leadership, problem-solving, adaptability, and interpersonal skills. Communication skills involve the ability to convey ideas and information clearly and effectively, while teamwork skills entail working collaboratively with others toward a common goal. Leadership skills encompass the ability to inspire and guide others, while problem-solving skills involve analyzing issues and finding creative solutions [5]. Adaptability skills refer to the ability to adjust and thrive in changing circumstances, and interpersonal skills involve building and maintaining relationships with others.

Soft skills are often seen as essential in today's fast-paced and interconnected world, as they allow individuals to navigate complex social and professional environments. In the context of college education, the development of soft skills is increasingly recognized as a vital component of holistic development and future success. Employers value candidates who possess a strong skill set, including both technical and soft skills.

Research has shown that soft skills can be developed and enhanced through various means, including educational programs and practical experiences. Physical education courses, in particular, have the potential to foster the development of soft skills, as they often involve teamwork, communication, problem-solving, and adaptability. Moreover, physical education courses that incorporate the concept of outdoor education provide students with unique opportunities to develop these skills in a natural and experiential setting.

3.2. Relationship between physical education and soft skills

Physical education courses play a significant role in the development of soft skills among college students. Soft skills refer to a set of interpersonal and communication abilities that are essential for personal and professional success. These skills include communication, teamwork, leadership, problem-solving, and adaptability.

Physical education provides opportunities for students to engage in team-based activities, such as team sports and group exercises. Through these activities, students learn to communicate with their peers, strategize, and cooperate towards a common goal. For example, in team sports like soccer or basketball, students need to communicate effectively to coordinate their movements and make quick decisions. This enhances their communication and teamwork skills.

Leadership skills are also fostered through physical education courses. Students often take on leadership

roles within their teams, such as team captains or group leaders [6]. These roles require them to take charge, make decisions, and motivate their teammates. By assuming these responsibilities, students develop leadership qualities and learn how to inspire and guide others.

Problem-solving skills are honed through physical education activities that involve overcoming challenges or obstacles. For instance, students participating in outdoor adventure activities need to find innovative solutions to navigate unfamiliar terrains or complete tasks. These experiences enhance their problem-solving abilities by encouraging them to think critically and analyze situations effectively.

3.3. Case studies and examples

(1) First case study: In the first case study, a group of college students participated in a 5-day outdoor physical education course focused on team-building activities. The students were split into smaller teams and were given various challenges that required them to work together and communicate effectively. One example of such a challenge was a ropes course, where the students had to rely on each other to navigate through obstacles and complete the course successfully. The results showed that after the program, the students demonstrated improved teamwork skills, as they effectively communicated, supported each other, and worked collaboratively to overcome obstacles.

(2) Second case study: Another case study involved college students participating in a 3-day outdoor physical education course that focused on leadership development. The students were given opportunities to lead various activities, such as leading a hike or coordinating a group exercise session. Throughout the program, the students were taught and encouraged to take initiative, make decisions, and effectively communicate with their peers. The results of this case study showed that the students displayed enhanced leadership skills, demonstrating confidence in their decision-making abilities, effectively delegating tasks, and motivating their peers to achieve common goals.

(3) Third case study: In the third case study, college students engaged in a 7-day outdoor physical education course that emphasized problem-solving skills. The students were exposed to various challenging scenarios that required them to think critically and find creative solutions. For example, they were tasked with constructing a makeshift shelter using limited resources within a specific timeframe. The results revealed that the students developed improved problem-solving skills, displaying the ability to analyze complex situations, think outside the box, and effectively collaborate with their peers to find practical solutions.

These case studies provide concrete examples of the influence of outdoor physical education courses on the development of college students' soft skills. Through team-building activities, leadership opportunities, and problem-solving challenges, students enhanced their communication, teamwork, leadership, problem-solving, and adaptability skills. These findings further reinforce the significance of incorporating outdoor education into the physical education curriculum to foster students' holistic development.

4. Empirical evidence of soft skills development under the influence of physical education in the concept of outdoor education

4.1. Methodology of the research

A qualitative research approach was employed in this study to explore the influence of physical education courses on the development of soft skills among college students, particularly under the concept of outdoor education. The research design included interviews and observations of college students who participated in outdoor physical education courses.

To gather relevant data, semi-structured interviews were conducted with a sample of college students who had completed outdoor physical education courses. The participants were selected using purposive sampling techniques, ensuring that a diverse range of students with different backgrounds and experiences were included in the study.

The interviews aimed to collect detailed information about students' experiences in outdoor physical education courses and their perceptions of the development of soft skills. The interview questions were designed to elicit responses related to various soft skills, such as communication, teamwork, leadership, problem-solving, and adaptability. Probing questions were used to delve deeper into the participants' experiences and insights.

Additionally, observations were conducted during the outdoor physical education courses to supplement the interview data. The researchers observed and documented the students' behaviors and interactions during activities that required the utilization of soft skills. These observations provided a more comprehensive understanding of how the physical education courses facilitated the development of the identified soft skills.

The data obtained from interviews and observations were analyzed using content analysis. Transcripts of the interviews were coded using thematic analysis to identify recurring patterns and themes related to the development of soft skills. The coded data were then organized into categories based on the identified soft skills, allowing for systematic analysis and interpretation of the findings.

4.2. Results and discussion

The results of this study provide valuable insights into the influence of physical education courses, specifically those incorporating outdoor education, on the development of college students' soft skills [7]. Through qualitative analysis of interviews and observations of college students who participated in outdoor physical education courses, several key findings emerged.

Firstly, it was observed that outdoor education in physical education courses played a significant role in enhancing college students' communication skills. Participants reported improved abilities in expressing their ideas, listening actively, and effectively conveying information to others. The outdoor setting provided opportunities for students to engage in authentic and meaningful communication, leading to the development of effective communication skills.

Secondly, the findings indicated that outdoor education in physical education courses fostered teamwork among college students. Through team-based physical activities and challenges, students learned to collaborate, cooperate, and contribute towards common goals. This, in turn, promoted the development of teamwork skills, such as sharing responsibilities, resolving conflicts, and effectively working together as a team.

Furthermore, the results revealed that outdoor education in physical education courses contributed to the development of leadership skills among college students. Participants reported increased confidence in assuming leadership roles, making decisions, and guiding others during outdoor activities. The outdoor environment provided a platform for students to practice and enhance their leadership capabilities.

Additionally, the study found that physical education courses incorporating outdoor education promoted the development of problem-solving skills among college students [8]. The outdoor setting presented students with real-life situations that required critical thinking, decision-making, and innovative problem-solving strategies. Participants reported improved abilities in analyzing problems, identifying solutions, and adapting to changing circumstances.

Lastly, the findings indicated that outdoor education in physical education courses enhanced college students' adaptability. The outdoor environment often presented unpredictable and unfamiliar situations that required students to quickly adapt and adjust. Participants reported increased flexibility, resilience, and the

ability to adapt to new and challenging circumstances.

5. Conclusion

The results of the research indicate that college students who participated in outdoor education activities as part of their physical education courses showed improvements in various soft skills. The outdoor education approach provided opportunities for students to engage in communication, teamwork, leadership, problem-solving, and adaptability. These skills are essential for their holistic development and future success.

By immersing themselves in outdoor activities, students were able to experience real-life situations that required them to collaborate with their peers, communicate effectively, lead a team, solve problems, and adapt to changing circumstances. This hands-on approach facilitated the development of these skills, as students had to rely on their abilities to overcome challenges and achieve their goals.

The findings of this study highlight the importance of incorporating outdoor education into the physical education curriculum. By integrating outdoor education activities, colleges can provide students with a well-rounded education that fosters the development of soft skills alongside academic knowledge. This approach allows students to acquire essential skills that are highly valued in the professional world and contribute to their overall personal growth.

In summary, this study supports the notion that physical education courses under the concept of outdoor education have a positive influence on the development of college students' soft skills. By engaging in outdoor activities, students enhance their communication, teamwork, leadership, problem-solving, and adaptability skills. Incorporating outdoor education in the physical education curriculum is crucial for colleges to foster students' holistic development and prepare them for future success.

Disclosure statement

The authors declare no conflict of interest.

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A New "Target-Seeking Style" Teaching Idea for Teaching General Education Courses in Large Categories in Engineering Universities

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Abstract: General education is a crucial aspect of undergraduate education, providing both knowledge and quality education. General education courses, encompassing all majors and grades, form the cornerstone of undergraduate education in engineering universities. Especially amidst the current evolution of undergraduate education and talent cultivation within engineering universities, under the new circumstances arising from initiatives such as the plan for nurturing outstanding engineers, the establishment of new engineering disciplines, and the implementation of enrollment and undergraduate course development, the teaching of large-category general education courses assumes a pivotal role. It contributes significantly to advancing academic disciplines and majors, fostering the scientific literacy of undergraduates, nurturing a spirit of inquiry, and enhancing their ability to make informed decisions regarding majors and careers. This paper delves into the fundamental purpose and significance of teaching general education courses in engineering universities under these new circumstances, focusing on the typical challenges encountered in the teaching process. Subsequently, the authors utilize the teaching of a large-category general education course, namely "Introduction to Nanomaterials and Their Development Frontiers," as a platform for pedagogical reform. They propose a novel "target-seeking style" teaching approach for general education courses within broader categories and explore innovative teaching methodologies aimed at addressing the common challenges associated with these courses. Ultimately, the aim is to cultivate a balanced blend of specialization and generalization among undergraduate students, thereby addressing the common issues encountered in general education teaching and realizing the overarching goal of fostering high-quality technical talents with a well-rounded skill set at the undergraduate level.

Keywords: General education; General education course teaching; New teaching ideas; New teaching mode

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1. The importance of general education in engineering colleges under new circumstances

During the twentieth session of the Political Bureau of the Communist Party of China Central Committee, the emphasis on the strategy of building a strong education country was highlighted. It was stated that "Building

a strong education country is a strategic precursor to building a socialist modernization power in all aspects, achieving a high level of scientific and technological self-reliance and self-sufficiency, promoting the common wealth of all the people, and comprehensively advancing the great rejuvenation of the Chinese nation with a foundation in Chinese modernization." Simultaneously, a strategic deployment was made to further strengthen science education, engineering education, and the independent training of top-notch innovative talents, providing talent support for solving China's key core technology challenges [1].

For the construction of a robust educational country, the foundation lies in basic education, with higher education serving as the leader [2]. Engineering universities, occupying a crucial position in higher education implementation, have a core objective of cultivating high-quality technical talents essential for social and economic development.

The current landscape of undergraduate education and development in engineering universities is marked by new circumstances, including the implementation of programs for training excellent engineers, the establishment of new engineering disciplines, and the execution of broad-based undergraduate enrollment and training. The objective of the program for cultivating excellent engineers in engineering education is to nurture versatile engineering talents with innovative capabilities adaptable to economic and social development, spanning undergraduates, master's, and doctoral levels [3,4].

Concurrently, the establishment of new engineering disciplines aims to cultivate diversified and innovative engineering talents through interdisciplinary intersection and integration, building upon traditional engineering disciplines [5,6]. To facilitate these objectives, many engineering universities have adopted large-scale enrollment in the college entrance examination, amalgamating disciplines with similar majors into broader categories [7]. For example, some universities have combined several disciplines including industrial engineering, industrial design, flight vehicle manufacturing engineering, and micro-electro-mechanical manufacturing engineering into a large mechanical category for college entrance examination enrollment [8]. Freshmen enrolled in a major category first go through one to two years of public courses and large general education courses for basic training, followed by carrying out their major distribution according to their learning interests, prerequisite courses, academic performance, and other conditions for professional streaming.

Curriculum education, comprising both professional and general education, constitutes the primary content of undergraduate education in current engineering universities [9]. In response to these new developments, general education assumes a crucial role in aiding students in choosing appropriate disciplines, promoting interdisciplinary synergy, constructing diverse knowledge systems, and nurturing composite talents. Consequently, general education is no longer merely auxiliary to professional education but an integral component of undergraduate education. The integration of these two educational facets synergistically fosters undergraduate knowledge enhancement and quality improvement, facilitating the cultivation of high-quality talents and laying a robust foundation for the development of technical expertise [10,11].

Large-category general education courses, specific to particular disciplines and offered to undergraduates across all majors and levels in engineering universities, form the cornerstone of general education. To promote engineering education's advancement under these new circumstances and enhance the effectiveness of undergraduate training, numerous engineering universities nationwide have instituted a plethora of general education courses. For instance, at the authors' university, approximately 600 general education courses are offered annually. Given that the educational outcomes of these courses directly impact talent cultivation results in engineering universities, enhancing the teaching quality of general education courses holds significant practical importance in advancing university education and talent cultivation.

2. Problems and causes of current teaching in general courses of large categories

Based on the authors' teaching experience in general education courses in the field of material science and engineering and survey results from other general education courses, several critical issues in the teaching process of large-category general education courses have been identified. The primary problem is the lack of clarity in teaching and learning objectives. Additionally, a significant challenge is the disconnect between teaching and learning practices. Specifically, the discrepancy arises from teachers delivering content that does not align with students' interests or needs, resulting in students failing to acquire the necessary knowledge and skills from these courses.

The ambiguity in teaching objectives for general education courses stems from a misunderstanding of their importance and function in both teaching and learning processes. Most general education courses are elective, and some closely resemble major courses. Evaluation methods often exclude exams, leading many students to view these courses as easy credit options rather than essential components of their education. Furthermore, some institutions do not consider results from general education courses in merits, awards, or graduation point calculations. To realize the substantive role of general education in talent cultivation, both teachers and students must develop a correct and thorough understanding of its purpose. Teachers should approach general education courses with the right mindset, and students should select them accordingly. The subsequent section will delve into the primary objectives and significance of teaching general education courses in conjunction with the new challenges and requirements of engineering universities' current development.

This section focuses on analyzing teaching and learning issues in large-category general education courses and their underlying causes. From the teachers' perspective, these courses typically involve specialized knowledge across various disciplines. However, with students from different grades and majors, discrepancies in understanding basic course knowledge are common. Traditional teaching methods often lead to two scenarios deviating from educational objectives: either courses become overly broad and shallow or excessively detailed and complex. Consequently, some students struggle to grasp the content, while others find it superficial.

Regarding the learning outcomes of students, differences in grades and majors lead to varying levels of comprehension of basic course knowledge. Many students express difficulty understanding general studies courses in certain majors, with some only taking these courses for easy credits rather than genuine interest. Most students find it challenging to delve deeply into specific course content within the class cycle. For instance, a first-year student planning to major in mechanical engineering may struggle with a general education mathematics course, finding the theoretical nature of lectures overwhelming and failing to grasp foundational concepts due to limited class time. This not only impedes understanding but also diminishes interest in learning.

Current teaching methods for large-category general education courses typically include classroom lectures, post-course reading, homework, laboratory visits, and teacher-student interactions. While these methods enhance teaching effectiveness to some extent, they often fail to engage students or integrate teaching outcomes with scientific research and real-life practice, hindering the fulfillment of general education requirements and goals.

3. New exploration of the purpose and significance of teaching general courses in large categories under new circumstances

Through the authors' survey, it has been observed that most engineering universities have introduced numerous general education courses with the primary aim of augmenting undergraduates' subject knowledge and broadening their scientific horizons. These courses serve to supplement the limited class hours of public and specialized courses. However, the authors argue that solely focusing on knowledge dissemination and

increasing class hours is insufficient to harness the full potential of general education in enhancing talent quality and advancing disciplinary development, especially in the evolving landscape of university education.

To fundamentally enhance the effectiveness of general education in engineering, there is a need to clarify the purpose and philosophy of general education teaching comprehensively. In light of the new requirements and circumstances in undergraduate education, the authors have conducted a new exploration of the purpose and significance of general education. This exploration is informed by years of teaching experience in large-category general education courses in the field of material science and engineering and the developmental trajectory of undergraduate students.

(1) Disseminating scientific knowledge and enhancing scientific literacy: Improving scientific spirit and cultural literacy is crucial for societal development. While basic physics and chemistry courses for junior students aim to augment their knowledge base, professional courses for senior students aim to enhance their expertise. General courses cater to students across majors and grades, focusing on bolstering scientific spirit and cultural literacy. The authors advocate for making large-category general courses compulsory, ensuring engineering majors complete a set number of credits in these courses before graduation.

(2) Reserving subject knowledge and enhancing students' ability to choose suitable disciplines: Large-category enrollment in many engineering colleges offers freshmen the opportunity to choose specific professional departments in their sophomore year. Despite this, many students still face confusion during major selection, leading to suboptimal choices and poor learning outcomes. Encouraging freshmen to take appropriate general education courses in their first year can guide them toward suitable majors during subsequent distributions, fostering better learning situations.

(3) Cultivating the spirit of learning and promoting interdisciplinary intersection: Large-category general courses provide a comprehensive knowledge system in related professional fields, expanding students' horizons, promoting knowledge integration, and enhancing their application abilities. These courses stimulate a spirit of continuous learning, improving the efficiency of training high-quality technical and composite talents in engineering colleges.

(4) Establishing concepts of family, country, and social responsibility: General courses serve as important platforms for ideological education. Teachers can integrate the history of science and technology with societal development into their teaching, fostering scientific spirit and patriotic sentiments among students.

4. An exploration of the "target-seeking style" teaching model for teaching general education courses in large categories

As frontline educators deeply involved in teaching general education courses for large material science and engineering classes, the authors have adopted the course "Introduction to Nanomaterials and Their Development Frontiers" as a platform for teaching reform. They introduce a novel "target-seeking style" teaching approach and explore a new mode of teaching for large general education courses. Through this endeavor, they aim to address the issue of separation between teaching and learning commonly encountered in such courses. By organically integrating teaching and learning, they aim to fully harness the advantages of general education in talent cultivation and achieve educational goals encompassing both "general" (cultivating scientific literacy) and "knowledge" (consolidating disciplinary knowledge).

The "target-seeking style" teaching idea, inspired by missile guidance technology, revolutionizes general education course teaching. This approach ensures that the teacher's content aligns directly with the learning expectations and goals of undergraduates. Continuous and dynamic feedback mechanisms during teaching enable

alignment between teaching content and students' learning objectives, fostering interest and clarity in learning purposes. This method not only enhances undergraduates' subject knowledge but also facilitates the transformation of knowledge into skills, thereby enhancing the educational effectiveness of general education courses.

The authors summarize the implementation of the "target-seeking style" teaching method in their general education course based on their teaching practice. In the initial class, teachers provide a comprehensive overview of the course content and related disciplines, prompting undergraduates to propose core problems or learning objectives based on their interests and majors. Through group discussions and individual guidance, undergraduates refine their learning objectives, enabling teachers to tailor teaching content to meet these objectives. Subsequent classes focus on in-depth exploration of selected topics, with teachers integrating lectures, literature reading, experiments, and student presentations to enhance understanding and application of knowledge.

For instance, in the "Introduction to Nanomaterials and Their Development Frontiers" course, undergraduates are introduced to various types and applications of nanomaterials, including more than ten types of nanomaterials such as nanomaterials for energy applications, nanostructured biomaterials, magnetic nanomaterials, carbon nanomaterials, and nanocomposites. Students propose specific problems or learning objectives related to these topics, which are addressed through a combination of lectures, literature readings, and practical experiments tailored to individual interests and learning goals. For instance, after listening to the overview of nanomaterials, an undergraduate who majored in aerospace wanted to deeply understand the application of nanofluids in the aerospace fields after learning the basic knowledge of nanofluids. In response to the undergraduate's learning needs, the authors first focused on the concepts, structures, classifications, and applications of nanofluids and other basic knowledge during the course, and used the literature on the application of magnetic fluid seal in the aerospace field as the undergraduate's post-course literature reading, and then helped the undergraduate directly understand the principles of magnetic fluids and their potential applications in the aerospace field through simple experiments.

In summary, the "target-seeking style" teaching model encourages undergraduates to explore their learning interests and objectives within the course syllabus, enhancing their learning spirit and promoting interdisciplinary knowledge acquisition. By breaking down the barriers between teaching and learning, this approach significantly enhances teaching effectiveness and fosters the development of undergraduates in engineering universities in the new era.

5. Conclusion

As frontline educators dedicated to teaching major general education courses, the authors have meticulously analyzed the common challenges encountered in the teaching process of these courses and their underlying causes. They have also conducted a thorough examination of the significant role played by major general education courses in the educational and teaching processes of engineering universities amidst the evolving landscape of higher education. Furthermore, they have introduced a novel "target-seeking style" teaching approach for large general education courses.

Through their teaching practice, the authors have demonstrated that the "target-seeking style" teaching holds promise in addressing the issue of separation between teaching and learning prevalent in current teaching methods for large general education courses. This approach not only ignites students' interest in learning but also fosters the seamless integration of teaching and learning, thereby fundamentally enhancing the effectiveness of teaching large general education courses.

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Disclosure statement

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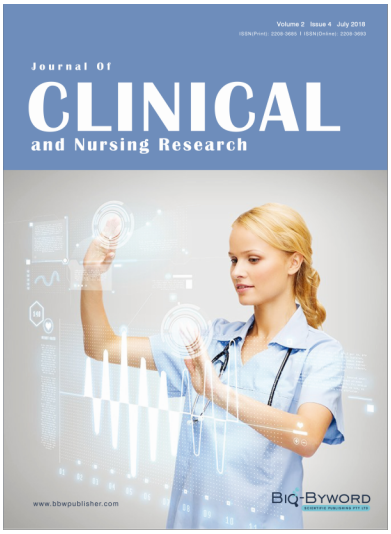
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