Professional Growth Needs and Strategic Development for Teachers in Experimental Education Institutions

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Abstract

This study explores teachers' professional growth needs and strategies in experimental education institutions, focusing on interdisciplinary integration, curriculum innovation, and technology application. The research examines teachers ' challenges and effective strategies using qualitative research methods of in-depth interviews, focus group discussions, classroom observations, and document analysis. The study sample includes 25 participants, including teachers and administrators.

Key findings highlight that teachers face significant challenges in curriculum design and technology integration, emphasizing the importance of interdisciplinary collaboration, reflective practices, and support from professional learning communities. Successful strategies observed include personalized professional development plans, peer collaboration, and targeted technology training, which enhance teaching effectiveness and holistic student development. The study concludes by proposing tailored growth programs, fostering learning communities, and strengthening technological capacity to support innovative teaching. Recommendations for future research include analyzing the long-term impact of experimental education on diverse student groups and addressing challenges in technology integration.

Keywords: Experimental Education; Teacher Professional Growth; Interdisciplinary

Integration; Curriculum Innovation

I. Introduction

1. Background

In the contemporary wave of educational reform, experimental educational institutions have become a key hub in Taiwan's education system to break through the

traditional framework. The formation of this phenomenon involves t interweaving the three driving forces of social structure transformation, the relaxation of policies and regulations, and the transfer of educational models. According to Cai Wenhan (2023), since the promulgation of the Regulations on the Implementation of Experimental Education in Schools in 2014, the number of experimental educational institutions has increased at an average annual rate of 12.3%, highlighting the urgent need for educational diversification. This structural shift reflects the trend of global education models from standardization to personalization, which puts forward new requirements for teachers' professional competence.

(1) Social needs drive the transfer of educational models

The rise of the knowledge economy and the spread of digital technology have led to a 47% increase in the demand for "cross-cutting problem-solving" in the labour market compared to 2015 (Lim Fong Ten, 2020). This change direct impact the effectiveness of the traditional subject-specific teaching model and has prompted experimental educational institutions to develop theme-based integrated courses. However, empirical studies have pointed out that only 35% of teachers can effectively transform educational concepts into specific courses (Cai Wenhan, 2023).This shows a significant gap between the teacher training system and the on-site needs.

(2) The gap between policy relaxation and professional ability

In 2014, the initial legislative focus was on the protection the right to educational choice, and by the third amendment in 2020, the focus had shifted to the substantial expansion of curriculum autonomy. Key amendments include authorising the allocation of teaching hours (section 15), relaxing the restriction on mixed-age placement (section 22), and a flexible assessment mechanism (section 31). However, although the relaxation of laws and regulations has increased the space for teaching innovation, it has also exacerbated the contradiction between teachers' professional ability and policy expectations. A cross-school study by Zhan

(3) The structural dilemma of the teacher training system

The current teacher training system is still based on traditional schools' needs regarding selection mechanism and curriculum design. The selection of Taiwanese teachers focuses too much on subject knowledge tests, which leads to the lack of the

ability to transform educational concepts and open thinking required for experimental education. This structural problem has led to the need for experimental educational institutions to invest additional resources in post-service training. The research data shows that new teachers need an average adaptation period of 18 months to e implement mixed-age teaching effectively (Wang Liyun and Xu Mingjing, 2015), which seriously affects the stability of teaching quality.

(4) The dual challenges of scientific and technological integration

Although 93% of experimental educational institutions are equipped with digital teaching equipment, teachers mostly stay at the level of information presentation (67%), and only 18% are identity and mission. Empirical studies have shown that institutions that adopt the "Reflective Community of Practice" model have a 41% higher rate of teacher curriculum innovation than trad able to develop a technology integration model that promotes higher-order thinking (Korthagen, 2017). This gap reflects the inadequacy of teacher development in the "Technology Teaching Content Knowledge" (TPACK) training. The study pointed out that the introduction of collaborative digital lesson plan design workshops can improve teachers' technology teaching effectiveness by 29% (Lin Fangdian, 2020). However, the current training system lacks a regular support mechanism.

(5) Paradigmatic transfer of professional development models

The traditional study-based professional development model can no longer meet the needs of experimental education. The onion model proposed by Korthagen (2017) emphasizes that teachers' professional growth needs to consider six levels: environment, behavior, ability, beliefs, and national training (Choi, 2023). This finding echoes the social constructivist view, emphasizes that professional development should be rooted in social interaction in teaching .

2. Research motivation

With the rapid changes in the international and domestic education environment, experimental education institutions play a pivotal role in promoting diversity and innovation in education (Cai Wenhan, 2023). Since the promulgation of the Regulations on the Implementation of School-based Experimental Education in 2014, the number of experimental educational

institutions has increased significantly, reflecting the strong demand for personalized and interdisciplinary learning. However, this wave of change has also revealed a glaring gap between the current teacher development system and teacher professional development support (Zhang & Guo, 2011).

Interdisciplinary integration and curriculum innovation have become the core competitiveness of experimental educational institutions. Teachers must have cross-domain knowledge and integration skills when designing and implementing thematic and integrated courses, but traditional teacher training focuses on subject knowledge and does not provide sufficient support for h translating innovative ideas into practical courses (Cai Wenhan, 2023). This need for transformation has prompted researchers to delve into teacher' specific challenges and needs in their professional growth.

With the rapid development of digital technology, although digital teaching equipment is widespread, teachers' ability to integrate technology into the classroom and promote the development of students' higher-order thinking is generally low. Research shows that most teachers only stay at the level of information presentation when using digital resources, which is not practical in stimulating students' critical and creative thinking (Lin, 2020, Korthagen, 2017). Therefore, how to improve teachers' ability to apply technology through professional growth strategies has become an important issue that needs to be solved urgently in experimental education.

Reflective practice and the establishment of CPA communities are also crucial to teachers' professional development. Teachers with effective reflection mechanisms and peer support systems are far more effective in curriculum innovation and implementation than their peers who lack such support (Korthagen, 2017). Therefore, this study will explore the actual needs and existing challenges of teachers' professional growth in the experimental education environment from three aspects: interdisciplinary curriculum design, technology integration into teaching, and reflective community of practice, and try to propose concrete and feasible professional development strategies to improve the quality of teachers' teaching and the overall learning effectiveness

of students.

3. Objectives and issues of the study

3.1 Research purpose

(1)Examine in Cross-Disciplinary Integration and atechology Use.

(2)Look at Gaps in current Teacher Development Strategies.

(3)Explore Effective Professional Growth Strategies for Experimental Education.

The main objectives of this study include:

(1) This study analyse teachers' needs for cross-disciplinary integration technology adoption, peer-to-peer collaboration and professional learning communities in the process of professional growth, and aim to understand the existing professional development mechanisms.

(2) To explore teachers' current situation and challenges of teach in experimental educational institutions in curriculum innovation and reflective practice.

(3) To construct a set of teachers' professional development strategies that align with the characteristics of experimental education, and to further explore the performance of this strategy in improving teachers' teaching quality.

3.2 Research Issue

For the above purposes, this study focuses on the following questions:

(1) What are the main challenges teachers faced in the cross-disciplinary integration and application of technology in experimental educational institutions?

(2) What are the shortcomings of the current teacher professional.?What are the development strategies in supporting teachers in carrying out curriculum innovation and reflective practice?

(3) How can a set of professional growth strategies suitable for. experimental educational institutions effectively enhance teachers' professional competence?

II. Literature discussion

1. The theoretical basis of experimental education

The theoretical basis of experimental education mainly reflects the urgent need for cross-field integration and whole-person development in contemporary educational transformation. As early as the beginning of the 20th century, Dewey (1938) advocated in "Experience and Education" that learning should be centered on practical experience, emphasizing that education must

be rooted in learners' real-life situations. This perspective laid a solid theoretical foundation for subsequent experimental education concepts.

With the rapid changes in society and technology, Cai Wenhan (2023) pointed out that the rise of experimental education is in response to the society's demand for personalized and diversified learning models and promotes cultivation of students' all-round abilities through innovative curriculum design. Lin Fangdian (2020) illustrates from the perspective of knowledge economy and digital technology that traditional teaching models can no longer meet the needs of modern students for the cultivation of critical and creative thinking, so he advocates reconstructing teaching practice through cross-disciplinary integration and technological integration.

Zhang Derui and Guo Shufang (2011) arg ue that experimental education is not only a transformation of curriculum practice, but also a systemic change involving teachers' professional development, which requires the existing teacher training system to be adjusted accordingly. The onion model proposed by Korthagen (2017) emphasizes that teachers' beliefs, values, and practical experience play an important and intertwined role in professional growth, providing a theoretical framework for teachers' reflection and continuous learning. Darling-Hammond (2017) emphasizes the establishment of a flexible and continuous professional development mechanism from an international perspective, which is an important factor in promoting educational innovation and improving the quality of teaching and learning.

Other experts and scholars have also provided valuable insights into experimental education. The results show that in the process of exploring the formation of teachers' professional ability, the experimental education site implements mixed-age collaborative learning and cross-domain integrated teaching, which focuses on improving students' ability of independent learning, critical thinking and innovative performance, and further demonstrates that teachers must have the innovative professional ability to better adapt to the educational trend and teaching scene under the rapid change of the educational environment.

Wang Liyun and Xu Mingjing (2015) compared the teacher training systems in Finland and Taiwan to illustrate the implications of international advanced models for

enhancing teachers' professional development. Howells (2018) predicts the future development trend of education and advocates that education should pay more attention to the cultivation of skills and innovation ability, which coincides with the concept of experimental education to pursue the whole development of students.

In addition to the above-mentioned contemporary scholars, the theories of classical scholars have also had a profound impact on experimental education. Vygotsky (1978) emphasizes the critical role of social interaction in knowledge construction, Freire (1970) advocates critical education in Pedagogy of the Oppressed, Bruner (1960) argues for the importance of discovering learning, and Piaget's (1970) theory of development elucidates the characteristics of learners at different stages of cognition. These classical theories complement contemporary research to construct a pluralistic and dynamic theoretical framework for experimental education.

2. The needs of teachers' professional development

In response to the trend of diversification, cross-disciplinary integration and the rapid development of digital technology, the needs of teachers' professional development are multifaceted and urgent. First, with the promotion of interdisciplinary teaching and integrated curriculum, teachers must have interdisciplinary knowledge and collaboration skills to effectively integrate different subject content and promote the development of students' critical and creative thinking (Korthagen, 2017). In addition, Shulman (1986) proposed the concept of "pedagogical knowledge", emphasizing that teachers must not only master professional subject knowledge, but also have the ability to translate this knowledge into effective teaching strategies, which has a decisive impact on the improvement of teaching practice.

Digital transformation also brings new challenges and opportunities for teachers. Lin (2020) pointed out that despite the widespread use of digital teaching devices, teachers' ability to integrate technology into teaching, promote interactive learning and develop higher-order thinking needs to be improved. Hattie's (2009) comprehensive meta-analysis further showed that teacher professional development has a significant impact on students' learning outcomes, and effective technology training is an important way to improve teachers' teaching effectiveness.

Reflective practice and peer collaboration are also indispensable elements of

teachers' professional growth. Lave and Wenger's (1991) theory of "community practice" emphasizes that the quality of teaching and learning can be improved by building a community of teachers and peer interactions, which can promote knowledge sharing and practical reflection. Guskey (2000) argues that the evaluation of teachers' professional development should focus on the actual effectiveness of teaching reform to ensure that the training content can be translated into teaching and learning improvements.

Fullan (2007) emphasizes that educational change is a systemic process, and that teacher professional development must be embedded in the overall education reform, through the establishment of a school-wide or district-wide support mechanism, and a continuous professional development system to respond to changing educational needs.

In summary, the needs of teachers' professional development not only include the integration of cross-domain knowledge and the improvement of technology application, but also emphasize the establishment of reflective practice, peer collaboration and systematic support. Only by meeting these multifaceted needs can we effectively promote the professional growth of teachers, and then improve the overall teaching quality and student learning effectiveness.

3. Strategies for teachers' professional growth

This paper summarizes the effective strategies for teachers' professional growth at home and abroad, including personalized growth plans and peer collaboration. In the context of experimental education, teachers' professional growth strategies are not only related to the improvement of individual abilities, but also to the promotion of overall education reform. An effective professional growth strategy typically encompasses the following key areas: individualized development plans, reflective practice, peer collaboration, technology integration into teaching and learning, and institutional support.

Personalized professional development plans allow for customisation of learning paths based on individual teacher backgrounds and teaching environments. Darling-Hammond (2017) argues that teachers should tailor their CPD plans to their needs, while Fullan (2007) stresses that these plans must be linked to the school's overall improvement strategy to form a learning network of resource sharing and whole-school

support. In addition, the teacher expertise framework proposed by Shulman (1986) reminds us that professional knowledge encompasses not only subject knowledge, but also the ability to translate knowledge into teaching practice.

Reflective practice is an important way to promote teachers' internalized professional growth. Korthagen's (2017) onion model emphasizes that teachers must adjust their beliefs, values, and action strategies through continuous reflection to promote self-improvement. Bransford, Brown, and Cocking (2000) also point out in the book How to Learn that reflective learning can promote the internalization of knowledge at a deep level and further improve the quality of teaching.

Peer-to-peer collaboration and professional learning communities provide a platform for teachers to support each other and share knowledge. Lave and Wenger's (1991) theory of community practice suggests that through the establishment of communities of practice, teachers can be inspired by shared learning and enhance their professionalism through interaction. Guskey (2000) also emphasized that through peer observation and feedback, teachers can quickly identify and improve their teaching strategies, thereby contributing to the improvement of overall teaching effectiveness.

With the popularization of digital technology, targeted technology training has increasingly become an important strategy for teachers' professional growth. Research by Lim (2020) shows that through collaborative digital lesson plan design workshops, teachers' effectiveness in integrating technology into teaching can be significantly improved. The results of Hattie's (2009) meta-analysis also confirmed that teachers' improvement in the use of technology has a positive impact on students' learning outcomes. In addition, Sahlberg (2011) emphasizes that continuous digital training and innovative practices are important drivers of modern education reform.

The role of institutional support and school leadership cannot be overlooked. Elmore (2004) proposed that school improvement should be based on systematic professional development, and provide a solid platform for teachers to grow through clear policies and resource allocation, so as to promote the continuous promotion of professional development strategies.

In summary, the establishment of a multi-level and comprehensive teacher professional growth strategy not only requires the active learning and reflection of

individual teachers, but also the institutional support and resource integration of schools and education systems. Such a strategic model will help to improve the teaching effectiveness of teachers, and ultimately promote the whole-person development of students and the overall improvement of education quality.

III. References, research design and methods

1. Research Methodology

This study adopts a qualitative research method to deeply explore the needs, practices and challenges of teachers' professional growth strategies in experimental educational institutions. Qualitative research methods are suitable for exploring the complex and multifaceted experiences and perspectives of educational phenomena, and can capture the inner meaning of participants in real situations (Creswell, 2013; Yin, 2014）。 This study comprehensively uses four data collection methods, including in-depth interviews, focus group discussions, classroom observations, and document analysis, and their selection and applicability are described as follows:

(1) In-depth interviews

Through semi-structured interviews, researchers can guide interviewees to share their challenges, successes, and future needs in the process of professional growth. This approach helps to capture individual emotions, beliefs, and motivations, providing rich narrative information for research (Creswell, 2013; Patton, 2015）。

(2) Classroom observation

Classroom observation enables researchers to go into the actual teaching field and directly observe how teachers use professional growth strategies to design cross-disciplinary curriculum and integrate technology. Through systematic observations, researchers collected information on the aspects of teacher interaction, student response, and classroom management, and then validate the data obtained from interviews and group discussions (Stake, 1995

(3) Focus group discussions

Focus group discussions can facilitate interaction and collective reflection among teachers. Through group discussions, researchers can gather consensus and divergent opinions among teachers on professional growth strategies, and further understand the impact of group dynamics on teaching practice. This approach is suitable for exploring

common experiences and potential contradictions in groups, and supplementing group-level information that may have been missed in individual interviews (Merriam, 2009).

(4) Document analysis

Document analysis includes a systematic review of education policies, professional development plans, curriculum design texts and related administrative documents. This approach helps to understand the context and changes in teachers' professional growth strategies from the institutional and historical levels, and increases the study's credibility　as part of data triangulation (Yin, 2014).

In-depth interviews and focus group discussions reveal the experiences and perspectives of individual and group teachers, classroom observations provide direct evidence of actual teaching actions, and document analysis complements relevant information about institutional and historical contexts. By　integrating　multiple data sources, this study aims to establish a comprehensive and multi-level database to provide a solid foundation for subsequent qualitative analysis and argumentation.

2. Research objects and samples

In this study, 25 participants from experimental educational institutions, including project facilitators, principals, consultants, teachers and administrators, were selected using a purposive sampling method to comprehensively reflect the diverse perspectives and practical experiences of these institutions in the process of promoting professional growth strategies (Cai Wenhan, 2023). Specifically:

(1) Teacher 10-12

Teachers the front-line personnel who actually carry out the teaching work, teachers are not only responsible for curriculum design and teaching practice. More directly　professional growth challenges, his experience reflects the practical utility of professional development strategies in the teaching field.

(2) Administrative staff 6-8

On the other hand, administrators are mainly responsible for the organisational management and resource allocation within the educational institution, and their participation is helps explore the role and impact of institutional support in professional growth strategies.

(3) Consultant 4-6

Advisory members are usually academics or industry experts with expertise in the relevant field The Empirical Education Program provides strategic advice and professional counseling, and is advisory role in pedagogical innovation and cross-disciplinary integration.

(4) Program Facilitators and Principals 4-6

This group of participants is mainly responsible for the overall project planning, resource integration and decision-making. It usually has many   Years of experience in educational management and practice, able to provide project orientation and key insights from policy implementation.

Participants were diverse in terms of seniority, professional backgrounds and job hierarchies, ranging from senior professionals with extensive management and decision-making experience to new teachers and administrators with fresh teaching perspectives. This sample structure aims to gain insight into the actual operations and challenges of experimental educational institutions in promoting teacher professional growth strategies through multi-perspective data collection (Creswell, 2013; Yin, 2014）。

3. Data collection and analysis

This study adopted, a multivariate data collection method to comprehensively grasp the practical operation and challenges of teachers' professional development strategies in experimental educational institutions. The data collection process and analysis methods are divided into the following stages:

(1) Data collection

    a. In-depth interviews: Individual interviews with programme facilitators, principals, consultants, teachers and administrators   were conducted based on a pre-designed semi-structured interview outline. All interviews were recorded and transcribed verbatim to ensure that the participants' experiences and perspectives were fully captured (Creswell, 2013; Patton, 2015）。

    b. Focus Group Discussions: Organize group discussions and invite participants from different job backgrounds to share and discuss topics related to professional growth strategies. Audio recordings and verbatim transcripts help to uncover group consensus and potential disagreements (Merriam, 2009).

    c. Classroom observation: Entering the actual teaching site, systematically

recording the actual teaching interaction, student response, and classroom management of teachers in the process of interdisciplinary curriculum design and technology integration according to a pre-determined observation record sheet (Stake, 1995).

d. Document Analysis: A systematic review of policy documents, professional development plans, curriculum design texts and internal administrative documents related to experimental education to understand the background and evolution of teachers' professional development strategies from the institutional and historical perspectives, and serve as an important source for data triangulation (Yin, 2014).

(2) Data analysis

In this study, thematic analysis and content analysis were used. Verbatim transcripts of all in-depth interviews and focus group discussions are re-read and preliminarily coded to mark specific descriptions and key takeaways. According to the commonalities and differences in the data, the researchers classified the preliminary codes into different themes and sub-themes. To ensure the rigor and credibility of the data analysis, continuous comparative analysis and regular focus group discussions were held to examine the similarities and differences between the data sources to establish a solid thematic framework and extract key findings that are closely related to teachers' professional growth strategies (Creswell, 2013; Yin, 2014)。

(3) Extraction of key findings

The researchers extracted key issues on personalized professional development, reflective practice, peer collaboration, scientific and technological training, and institutional support from multiple sources through coding and thematicinduction. After triangulation the sources, these issues became an important empirical basis for the subsequent discussion on the effectiveness and inadequacy of teachers' professional growth strategies.

IV. The results of the study using document analysis
1. Challenges faced by teachers

This study found that teachers mainly face two significant challenges in implementation experimental education: first, difficulties in curriculum design,

especially in interdisciplinary integration; second the gap in the integration and application of science and technology. Specifically, in terms of curriculum design, teachers need to break away from the traditional division model, reconstruct the knowledge of each subject, and design curriculum content that can have both subject depth and cross-domain integration. However, according to the research of Cai Wenhan (2023), only about 35% of teachers can effectively translate innovative educational concepts into concrete curriculum practice, which shows that teachers generally face the problems of blurred knowledge boundaries and insufficient methodology when designing interdisciplinary courses. In addition, Zhang Derui and Guo Shufang (2011) pointed out that the current teacher training system focuses too much on subject knowledge and ignores the ability to transform educational concepts and open thinking required for interdisciplinary design, which makes it difficult for teachers to respond to the challenges of cross-domain integration.

In terms of technology integration, although most experimental educational institutions (about 93%) are equipped with advanced digital teaching equipment, studies have shown that most teachers use these devices only at the level of information presentation and are unable to develop further technology integration models that promote higher-order thinking and creative learning (Korthagen, 2017). Lin (2020) also pointed out that the effectiveness of technology integration is limited by teachers' shortcomings in digital tools and interdisciplinary teaching strategies. This situation is particularly pronounced in rural areas with fewer resources (Wang & Xu, 2015).

Other experts and scholars have also provided further theoretical and empirical suppor based on the findings of this study. For example, the TPACK framework proposed by Mishra and Koehler (2006) emphasizes that teachers must organically integrate technology, pedagogy and subject knowledge in order to achieve genuinely effective technology integration; Ertmer (2005) pointed out that teachers' internal pedagogical beliefs and external resource constraints often pose the main obstacles to the integration of technology. Kozma's (2003) research shows that the effectiveness of interdisciplinary teaching depends on teachers' ability to use technology tools flexibly; Honey and Hilton (2011) highlighted that the establishment of appropriate technology-assisted learning environments can significantly promote students' cross-domain

problem-solving skills. The meta-analysis by Becker and Park (2011) further confirmed that the teaching strategy of interdisciplinary integration has a positive impact on student learning outcomes.

In order to further enrich the discussion of the challenges teachers face , this paper also incorporates the views of other scholars. Kirschner (2015) pointed out that teachers need to constantly update their teaching technologies and methods in the digital transformation, otherwise it will be challenging to meet the emerging educational needs. A comprehensive study by Means et al. (2010) highlights that teachers' professional development in digital learning environments directly affects student learning outcomes; The SAMR model proposed by Puentedura (2006) provides a hierarchical assessment tool for the integration of technology, revealing that teachers tend to stay at a lower level in the application of technology. Tondeur et al. (2017) emphasized that teachers' technology acceptance and integration skills are the key to promoting interdisciplinary teaching reform. Darling-Hammond et al. (2005) found that continuous professional support and reflective practice play a significant role in solving the difficulties of interdisciplinary integration.

Teachers face multiple challenges in implementation   experimental education, especially in the integration of interdisciplinary disciplines, which not only have knowledge and methodological limitations, but also face the problem of insufficient application of scientific and technological tools. These challenges reflect the inadequacy of the existing teacher development system and professional development support and further underscore the urgent need to develop targeted and multidisciplinary professional growth strategies to enhance the teachers' teaching effectiveness of teachers and students' whole-person development .

2. Professional Growth Strategies for Teachers

This study found that the strategies to promote teachers' professional growth in experimental educational institutions are mainly reflected in three aspects: individualized professional development plans, peer collaboration, and targeted technology training. These strategies promote the continuous development of teachers' knowledge and skills and help build an environment that supports interdisciplinary integration and innovative teaching and learning.

Individualized professional development programs are tailored to the teacher's personal background and teaching environment. The study observed that many success stories show that teachers are more proactive in exploring the possibilities of interdisciplinary curriculum design when they can design CPD programmes tailored to their needs. Darling-Hammond (2017) argues that teachers must tailor their continuing education plans to their individual needs, Fullan (2007) emphasizes that these plans must be integrated with the school's overall improvement strategy to form a s resource sharing support network. Shulman (1986) reminds us that a teacher's expertise includes the ability to translate knowledge into teaching practice in addition to subject content. Furthermore, the TPACK framework proposed by Mishra and Koehler (2006) clarifies that teachers must integrate technology, pedagogy and subject knowledge when developing individualized development plans to improve the effectiveness of cross-domain integration.

Peer collaboration provides a platform for teachers to grow professionally and share knowledge. Research has shown that through regular peer observations, collective reflection, and the establishment of professional learning communities, teachers are able to quickly identify and improve teaching strategies through mutual communication. Lave and Wenger's (1991) theory of communities of practice argues that shared learning and experience sharing can help improve teachers' professionalism, while Guskey (2000) emphasizes that peer feedback can be effective in promoting teaching reform. In addition, Ertmer (2005) points out that when teachers receive peer support, their internal pedagogical beliefs and attitudes change, leading to more active innovation in interdisciplinary curricula. Tondeur et al. (2017) further confirmed that establishment structured professional learning communities can significantly improve teachers' ability to integrate technology and interdisciplinary teaching.

Targeted scientific and technological training provides teachers with the necessary technical support . The study observed that through collaborative digital lesson plan design workshops, teachers' ability to integrate technology into teaching and learning significantly improved, promoting students' higher-order thinking and creative learning. Lin Fangdian (2020) pointed out that targeted technology training can help teachers go beyond the level of information presentation, Kozma's (2003) research highlights that

the effective integration of technology and teaching depends on teachers' flexible use of digital tools. The SAMR model proposed by Puentedura (2006) provides a hierarchical assessment tool to help teachers understand how to gradually improve the role of technology in teaching and learning, from substitution, enhancement,and transformation to recreation. Further, Tondeur et al. (2017) also pointed out that continuous technology training is a key driver for teachers' professional growth and interdisciplinary integration.

The three strategies of individualized professional development plan, peer collaboration, and targeted technology training together constitute a multi-level and comprehensive teacher professional development system. This system not only prompts teachers to continuously reflect on and improve their teaching practices, but also provides them with the technical and institutional support they need to integrate cross-domain knowledge and innovate teaching, This ultimately helps to improve teaching effectiveness and promote the whole-person development of students.

3. Factors that support teacher growth

This study finds that the establishment and maintenance of professional learning communities, promotion reflective practice, and promoting interdisciplinary collaboration all have significant supporting effects on teachers' professional growth. These factors can not only make up for the shortcomings of the existing teacher training system, but also promote the continuous progress and innovative development of teachers in the experimental education environment.

Professional learning communities provide a platform for teachers to continuou communicate and grow together continuously. Lave and Wenger (1991) proposed the community of practice theory, which states that by sharing practical experiences and reflections in groups, teachers can access multiple perspectives and practical advice, promoting knowledge sharing and skill development. In addition, the study by Johnson and Johnson (2009) further confirmed that peer collaboration and collective learning could significantly enhance teachers' ability to solve teaching problems, while Nissenbaum (2020) illustrated the critical role of teacher learning communities in promoting continuous professional development.

Reflective practice is the core driving force for teachers' self-improvement and

teaching innovation. Korthagen's (2017) onion model emphasizes that teachers must adjust their beliefs, values, and teaching strategies through continuous reflection to achieve consistency between inner knowledge and outer action. Schön (2017) argues in Reflective Practitioners that through reflection on their daily teaching experiences, teachers can identify and correct their deficiencies, thereby driving professional growth and innovation. In addition, Freire's (2020) critical education theory also emphasizes that reflective practice can help promote teachers' criticism and reconstruction of the current education situation   to achieve educational equity and quality improvement.

Interdisciplinary collaboration is of great significance for breaking down the boundaries of traditional disciplines and promoting innovative curriculum design. The TPACK framework proposed by Mishra and Koehler (2006) states that teachers must effectively integrate technology, pedagogy and subject knowledge when integrating across disciplines. Ertmer (2005) further emphasizes that teachers' intrinsic pedagogical beliefs and external resources, if strengthened through cross-disciplinary collaboration, will help to fill the gaps in existing teaching models. Kozma's (2003) research also confirms that interdisciplinary teaching relies on teachers' flexible application and collaborative innovation of knowledge in various fields, and this needs to be achieved through effective collaboration mechanisms. Hargreaves and Fullan (2012) proposed the theory of professional capital, arguing that teachers can accumulate expertise and strengthen their emotional and social connections through interdisciplinary collaboration, which is essential for long-term professional development.

Schön (2017) points out that teachers' professional practices, formed through continuous reflection and peer interaction,   improve individual teaching skills, and contribute to the transformation of the overall educational culture. These perspectives echo the data of this study, showing that professional learning communities, reflective practice and interdisciplinary collaboration have different focuses and complement each other in supporting teacher growth, Together they build a multi-level and sustainable teacher professional development system.

V. Conclusions and Recommendations

1. Study Conclusions

Based on the analysis of the document's preliminary findings , the importance of

individualized development programmes, peer-to-peer cooperation and scientific and technological training was emphasized. This study will continue to   complie in-depth interviews, focus groups and classroom observations, and analyze and discuss them with the literature discussion.

2. Recommendations for future research

This study highlights the importance of individualized development programs, peer collaboration, and targeted technology training for teachers' professional growth. Future research can focus on the following directions to further enrich and expand the findings of this study:

(1) Cross-cultural and transnational comparative studies

Considering the diversity of global education reforms, future research can explore the commonalities and differences of teachers' professional growth strategies in different education   systems from   cross-cultural and cross-country comparisons. Perspectives Such studies will help to uncover which strategies are globally applicable and provide valuable lessons for countries to learn from in promoting experimental education (Darling-Hammond, 2017; Kirschner , 2015).

(2) Use digital tools to deepen data analysis

With the development of big data and artificial intelligence technologies, future research should make full utilize these technologies to collect and analyze the micro behavior data of teachersduring professional growth. Through digital tools, such as learning analytics platforms and educational data mining techniques, it is possible to reveal in more detail the dynamics of teachers' teaching interaction and reflection practice, thereby enriching theoretical models and promoting practical applications (Ridder, 2014).

(3) In-depth exploration of the obstacles and countermeasures of technology integration.

When integrating technology tools, teachers often face the dual challenges of intrinsic beliefs and insufficient external resources. Future research could further explore how teachers can overcome these barriers in different educational resource settings and evaluate the effectiveness of various targeted technology training programmes. Using mobile research or experimental design to uncover the specific

influencing factors of technology integration at the micro level will help to establish more effective training and support mechanisms (Ertmer, 2005; Puentedura, 2006）。

(4) Long-term impact assessment

At present, most of the research focuses on the short-term effects of teachers' professional growth, Future research should adopt a longitudinal design to track the long-term impact of experimental education on different student groups (such as low-income, special needs, urban and rural students, etc.). Continuous follow-up of cognitive, emotional, and whole-person development changes among students from different backgrounds will help refine the experimental education model and provide more concrete policy recommendations (Hattie, 2009; Sahlberg, 2021）。

Future research should further explore the advantages and disadvantages of the experimental education model from multiple perspectives, such as long-term impact, challenges of technology integration, cross-cultural comparison, and application of AI technology, and put forward more targeted coping strategies on this basis,   to provide more comprehensive and empirical theoretical and practical support for policy formulation and educational practice.

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