

Research on the Improvement Path of Teacher-Student Relationships in Applied Undergraduate Universities Based on Grounded Theory*

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Abstract

To address issues such as the weakening of emotional bonds, mechanical and monotonous interactions, and rigid teaching forms in traditional classrooms of applied undergraduate universities, this study employs the grounded theory research method. Through theoretical sampling, semi-structured interviews were conducted with relevant teachers and students. After open coding and axial coding, six main categories were extracted: “mutually beneficial and symbiotic teacher-student relationships”, “authoritative and mechanical teacher-student relationships”, “instrumental participation of technology”, “ecological participation of technology”, “embodied practice dimension”, and “symbolic abstraction dimension”. The logical relationships between these main categories were organized, and the core category of “teacher-student relationships in applied undergraduate universities” was identified. A model of teacher-student relationships in applied undergraduate universities was constructed. Three strategies for improving teacher-student relationships were proposed: “technological optimization”, “cognitive reconstruction”, and “relationship evolution”, which provide insights for promoting the collaborative development of teachers and students in applied undergraduate universities.

Keywords

Grounded Theory, Universities, Teacher-Student Relationships

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1. Introduction

Teacher-student relationships have always been the most fundamental and important interpersonal dynamic in school education and a focal point in both educational theory and practice. In the digital-intelligent era, these relationships are undergoing unprecedented changes. The traditional hierarchical dynamic, where teachers dominate, is being challenged, and conflicts between teachers and students are becoming increasingly prominent (Yang, 2010). Therefore, addressing these conflicts and establishing harmonious, equal teacher-student relationships has become a crucial task for promoting the mental and physical health of both parties, deepening educational reforms, and advancing harmonious education.

As a representative applied undergraduate university, B College exemplifies the integration of industry and education and the construction of digital-intelligent curricula, accurately reflecting the characteristics of teacher-student relationships under digital-intelligent empowerment. Grounded theory emphasizes in-depth exploration. Through semi-structured interviews and observations of B College, systematic data on teacher-student relationships can be obtained, avoiding the fragmentation and inconsistency that may arise from multi-school data.

Thus, this study takes B College as the research setting and employs the grounded theory research method to analyze data and explore improvement paths for teacher-student relationships in applied undergraduate universities, providing a reference for reconstructing teacher-student relationships in the new era.

2. Research Design

2.1. Research Method

Grounded theory is a qualitative research method, whose main aim is to build theories based on empirical data. Researchers usually start without theoretical hypotheses and directly engage in practical observations, extracting empirical generalizations from raw data and elevating them to theories (Chen, 1999). This is a bottom-up approach, which involves systematically collecting data to identify core concepts that reflect social phenomena and constructing related theories through the connections among these concepts (Chen, 1999). This paper, based on the coding, induction and analysis of the establishment process of the teacher-student relationship in application-oriented undergraduate colleges, constructs a model of the teacher-student relationship in such colleges, which can reveal the paths to enhance the teacher-student relationship and help strengthen the bond between teachers and students.

This study mainly adopts face-to-face interviews to obtain first-hand data. Examples of the interview outline for teachers: How do you understand the “teacher-student learning community”? Can you describe its core features with three keywords? In the courses you teach, through which specific behaviors do teachers and students demonstrate the “community” trait? What is the biggest difficulty you encounter in building a teacher-student learning community? Have you ever ex-

perienced a moment when you truly became a learning partner with your students? What were the key factors at that time? When using platforms like Cloud Classroom or Rain Classroom, which functions do you use frequently? Which ones do you hardly use? Why? If you were asked to design a task that requires the joint completion of teachers and students using the existing platform, how would you do it? What obstacles might you face?

Examples of the interview outline for students: When you mention “teacher-student learning community”, what scene comes to your mind first? In which courses do you feel this the most strongly? Do you think you and your teachers have formed a “learning team” through technological tools? Which functions have promoted this feeling? When using the course platform, what functions do you most hope to have? Do the existing functions meet this need? How do you feel the interaction with teachers through technological tools differs from face-to-face communication? Which way do you prefer and why? Please give examples from your university courses. If you were to design the interaction rules for a course entirely by yourself, what rules would you set? Do you think technological tools can help teachers better understand your personalized needs? Such as which needs?

2.2. Sample Selection

This study adopts the procedural grounded theory approach proposed by Strauss and Corbin. Grounded theory aims at theory generation rather than statistical generalization. It takes College B as a typical research field. Through intensive interviews and participant observations within a single college based on grounded theory, it can more systematically capture details of teacher-student interactions, avoid superficial and underdeveloped research caused by fragmented data from multiple colleges, and is more conducive to tracking the diachronic evolution of technology application and establishing trust relationships to obtain information on sensitive issues.

To obtain representative samples, this study used a snowball sampling method. Initially, teachers and students with excellent classroom teaching performance, high satisfaction ratings, and unique insights into teacher-student relationships, university development, and personal growth plans were interviewed. Subsequently, additional participants were recruited through recommendations. The snowball method can reach more circles and expand coverage in terms of disciplines, genders, and academic levels. However, this method may lead to selection bias: the initial subjects are mostly groups with good evaluations, and their recommendations rarely reach teachers and students who hold negative views or perform averagely.

The study employed both individual and group interviews, involving 16 teachers and 20 students from B College. Individual in-depth interviews were conducted with students, while teachers were interviewed in pairs. Each interview lasted approximately 40 minutes, yielding 40 interview transcripts. During one-

on-one interviews, participants had ample time to think and express themselves, and interviewers could observe facial expressions and subtle cues to better understand their perspectives on teacher-student relationships. With consent, interviews were recorded and archived (Sun, 2011). The information of the interviewees is shown in Table 1.

Table 1. Example of respondent information.

Serial number	Position/Class	College	Reasons for recommending the interview	Location of the interview	Interview scenario
1	Lecturer	School of Economics and Management	Has won awards in teaching competitions many times.	kang321	Calm and serious
2	Associate Professor	School of Economics and Management	Has won awards in teaching competitions many times.	kang310	At first serious, then talkative.
3	Lecturer	School of Economics and Management	Winning awards in teaching competitions and being passionate about teaching.	Kangzhuang Library	Excited, talkative, and insightful
4	Senior Laboratory Technician	School of Economics and Management	Having been engaged in teaching for many years, I have always cared for and loved my students.	Kang305	Excited, talkative and insightful.
5	Associate Professor	School of Marxism	Have unique insights into teaching.	Main campus library817	Calm and methodical
6	Lecturer	College of Humanities and Social Sciences	Having been engaged in teaching for many years, always cared for and loved my students.	Main campus 1510	Pleasure, with a smile on the face
7	Associate Professor	College of Humanities and Social Sciences	Having been engaged in teaching for many years, always cared for and loved my students.	Main campus 3501	Pleasure, with a gratified smile on the face
8	Associate Professor	School of Information Engineering	Having been engaged in teaching for many years, I have always cared for and loved my students.	Comprehensive Experimental Building804	Calm and talkative
9	Associate Professor	College of Mechanical Engineering	Having been engaged in teaching for many years, I have always cared for and loved my students.	Comprehensive Experimental Building415	A helpless smile, confusion
10	Environmental Engineering233	College of Mechanical Engineering	Counselor's recommendation	Main campus	Quiet, shy and very serious.
11	Robotics233	College of Mechanical Engineering	Counselor's recommendation	Main campus4501	Calm, fluent language with ideas.

Continued

12	Computer Science222	School of Information Engineering	Counselor's recommendation	Main campus	Serious and tense
13	Computer Science222	School of Information Engineering	Counselor's recommendation	Main campus	A bit hasty, not very positive.
14	Polymer Science233	College of Chemical Engineering	Students' recommendation	Main campus 4501	Feeling calm, but frowning and thinking a lot.
15	Environmental Engineering233	College of Mechanical Engineering	Students' recommendation	Main campus 3102	With a calm mind and a smile on the face.
16	Accounting233	College of Humanities and Social Sciences	Students' recommendation	Kang201	Excited
17	Accounting232	College of Humanities and Social Sciences	Students' recommendation	Kang205	Excited
18	Artificial Intelligence Studies231	School of Artificial Intelligence	Students' recommendation	Comprehensive Experimental Building813	Calm, smiling, and thoughtful.
19	Logistics Management Major231	College of Humanities and Social Sciences	Students' recommendation	Kang103	Calm, smiling, and thoughtful.
20	Logistics Management Major231	School of Artificial Intelligence	Students' recommendation	Main campus	Feeling rather excited.

After data collection, a project titled “Teacher-Student Relationships in Applied Undergraduate Universities Based on Course Learning” was created in Nvivo11, and the data were imported for coding.

3. Grounded Analysis

Using the grounded theory research method, three-level coding was applied to process the interview data and construct a theory on improving teacher-student relationships in applied undergraduate universities.

3.1. Open Coding

Open coding is the fundamental work for conducting grounded theory research. By conducting a detailed analysis, organization, and comparison of the original textual data, initial concepts and initial categories are discovered. This study follows the operational process of “original data → tagging → conceptualization → categorization”, and reinterprets the original data based on the logical relationships between concepts and categories (Zhu & Cheng, 2024).

First, the interview texts are summarized and labeled sentence by sentence and paragraph by paragraph. The researchers read 36 interview materials repeatedly, identifying and labeling all phenomena, behaviors, viewpoints, emotions, etc., re-

lated to teacher-student relationships. The labels are close to the original statements, and descriptions are made using the interviewees' original words or concise phrases as much as possible. A total of 403 original labels are generated at this stage. Due to space constraints, only examples of the coding process are shown in **Table 2**.

Table 2. Examples of open coding (student interviews).

(a)	
Original Case Materials	Line-by-Line Encoding Results
Material 1: Whether it is the head teacher or other teachers, they have given us help in life. For example, my head teacher had two conversations with me. Because I transferred from another major, he told me how to make up for the courses I missed in my freshman year with the highest efficiency.	Teachers take the initiative to care about students after class and have conversations with them
Material 2: Regarding the garbled code problem just now, we couldn't figure it out after working on it for three days. The teacher didn't know the reason at first either. But when the teacher worked on it with us that day, we immediately knew where the garbled code appeared and understood it right away. The speed and efficiency of solving the problem also increased immediately.	Joint teacher-student operations improve the efficiency of problem-solving
Material 3: In some dangerous situations of precision engineering practice, VR virtual simulation is used. I have taken precision engineering practice courses, such as fitter, 3D printing, etc. I think this is digital teaching.	Integrate VR virtual simulation and 3D printing technology into teaching
Material 4: These teachers in our school all like to talk about some of their past work experiences in companies during the course introduction. For them, these may be very ordinary things, but for us, these things are very fresh and things we haven't been exposed to yet. So listening to these things will also broaden our horizons.	Sharing work experience in class can help students broaden their horizons
Material 5: The key problem is how you can transform these knowledge points into something interesting, so that students can follow you in these 45 minutes or even two or three hours. This is quite difficult, so you have to use a lot of so-called teaching tools and teaching methods. DeepSeek has provided me with a lot of help.	DeepSeek provides teachers with new ideas and methods
Material 6: That teacher is really nice. He said, don't worry, I will contact these five teachers immediately to have the exam papers regraded, and after regrading, give them to him separately. So in this case, it ensures that he can submit his grades for review in time and graduate on time.	Teachers help students solve graduation problems
Material 7: I think on the one hand, theoretical knowledge does have its own boring side, which will reduce students' head-raising rate.	Boring courses lead to a low head-raising rate
Material 8: The first is critical thinking, that is, we don't blindly believe in many things. We have accepted some knowledge points. For example, in a case analysis, we can conduct in-depth discussions on such a case from different positive and negative aspects. This ability is relatively weak. Another point is based on knowledge. Can I really use it to solve some problems I encounter in my future work after learning it?	Students' critical thinking and ability to apply knowledge are insufficient

Continued

<p>Material 9: When we usually meet classmates in the teaching building, or some children with learning problems often go to the office to make up classes or choose courses. These children may feel that they are very bad in their hearts. At this time, when we meet them at other times and chat with them, we will encourage them. When you see an encouraged child in class, there is light in his eyes and he won't be so downcast, which will give him confidence, because everyone may have shortcomings.</p>	<p>Teachers encourage students after class and give them confidence</p>
<p>Material 10: Coupled with some of my passionate speeches and state, even if this student's subjective initiative was not so high at the beginning, but seeing that the teacher is so passionate, I have no reason not to cooperate well. So I think this effect is still very good.</p>	<p>The teacher's passionate state will enhance students' enthusiasm</p>
(b) Open coding example (teacher interview)	
Original Case Data	Row-by-Row Coding Results
<p>In the teaching mode, students should participate in more so-called practical projects. In this way, it is good for teachers to guide or take the lead. In this way, the direct communication between students and teachers is increased through such projects.</p>	<p>Practical projects can increase opportunities for teacher-student communication</p>
<p>When I look up literature, including using AI technology to help me summarize some content, including drawing beautiful pictures, I have gained and improved.</p>	<p>AI technology can help teachers summarize content and draw pictures</p>
<p>I ask you to bring books, or I ask you to do something. In this way, if you pay attention to him, he will feel that you care about him. He needs to be concerned, cared for and loved. So if he can feel this from you, no matter how strict your requirements or what you say, he will be very willing to listen.</p>	<p>Students need to be noticed by teachers before they are willing to listen</p>
<p>In the process of teacher-student cooperation, the feedback from students to teachers is that teachers will also learn in the process of guiding students. Because he is not a teacher or an encyclopedia. Before guidance, he will also conduct research in various aspects and then read some of the latest literature and books, etc. So this is an improvement.</p>	<p>Teachers can improve their own abilities in the process of guiding students</p>
<p>Our professional course teachers also approve of us using these AI software to look up some data and literature.</p>	<p>Teachers approve of students using AI</p>
<p>How to use AI for salary management, and it will also directly tell us which contents, such as repetitive work, can be directly completed through AI.</p>	<p>Teachers use AI for salary management and complete repetitive content</p>
<p>The education received by teachers is more in-depth and professional. They may think that some very simple nouns can be skipped directly and ignored directly. However, a major difficulty for us in the learning process is to first know what these nouns mean. Operations that teachers may think are easy have become a challenge for us. This is also an existing problem.</p>	<p>Differences in cognition between teachers and students lead to students' failure to understand knowledge</p>
<p>Because the teacher will definitely check what was learned in the previous class before each class, students need to review the night before and have the ability to draw inferences from one instance.</p>	<p>Teachers' pre-class review trains students' ability to draw inferences from one instance</p>
<p>I think it has something to do with the students themselves. For example, I am naturally not good at math. Even if I sit in the front row and listen carefully, I may just pass the line. It actually has a certain relationship with my personal proficiency and foundation.</p>	<p>Different student foundations lead to different class effects</p>
<p>Teachers teach students professional course knowledge, and then students teach teachers some trendy things in reverse, such as computers and the use of AI.</p>	<p>Teachers teach knowledge, and students teach teachers to use new tools</p>

Second, the 403 labels are initially abstracted and summarized. Multiple labels that express similar meanings or refer to the same phenomenon are generalized to extract higher-level initial concepts. This process requires researchers to continuously compare the similarities and differences between labels, merge redundancies, and refine expressions. A total of 82 initial concepts are obtained in this step. The conceptualization process of the interview texts is listed below. Due to space constraints, only some examples are provided in **Table 3**.

Table 3. Example of open coding.

Label	Initial Concept
The teacher teaches students how to use AI to support learning in class. The teacher recommends students to use AI to find cases	Teachers teach students to use AI
The teacher can help students develop good habits. The teacher provides ideas for students to solve problems on their own The teacher cultivates students' ability to solve problems on their own	Cultivation of students' autonomous ability
Classroom interaction is still mainly teacher-led The teacher is in a dominant position in in-class teaching	Teacher-led interaction
The teacher has a pretty good relationship with most students The teacher-student relationship is generally harmonious	Harmonious teacher-student relationship
The teacher demonstrates simulation circuits for students to enhance their learning interest The teacher integrates interdisciplinary cases into classroom teaching The teacher presents cases for students to analyze and mobilizes students' enthusiasm	Case-interaction driven learning
The teacher and students learn knowledge in one field together Teacher-student collaborative assignments improve the efficiency of problem-solving	Teacher-student collaboration improves efficiency
Adopt different teaching methods according to different students Prepare lessons according to students' pre-class tests and surveys Collect students' improvement suggestions through questionnaires after class	Flexible adaptation of teaching methods

The third step involves further summarizing and refining the initial concepts. During the previous tagging and preliminary conceptualization process, there were some similar concepts. In this step, all the concepts can be deeply summarized and integrated to make the final concepts more precise and appropriate (Ge et al., 2025). Through tagging and preliminary conceptualization, a total of 34 concepts were obtained in the process of conceptualization in this article, namely: teacher-student emotional connection; deepening of harmonious relationship; two-way empowerment through collaboration; development driven by trust; two-way inspiration between teachers and students; construction of ideal model; differences in course participation; differences in student abilities; two-way influence of atmosphere; environment affecting relationship; teacher reflection and improvement; low-level emotional connection; cognitive hindrance to relationship; one-way communication between teachers and students; solidification of teacher-

student roles; rigidity affecting interaction; technology-assisted learning; technology promoting communication; teaching relying on technology; high degree of technology application; technology promoting teaching; use of simple tools; technology remaining superficial; weak technology functions; technology-assisted functions; embodied ability cultivation; all-round development of embodiment; practice case-driven; dynamic adaptation of teaching methods; deterioration of course nature affecting relationship; weakening of emotional connection; abstraction into synonyms; technology mediation strengthening; theory divorced from practice. The categorization process is shown in **Table 4**.

Table 4. Categorization.

Concept	Category
Aa1: Emotional connection between teachers and students Aa2: Deepen harmonious relations	AA1 High emotional connection
Aa3: Collaboration and mutual empowerment Aa4: Trust drives development: Aa5: Mutual inspiration between teachers and students Aa6: Ideal model construction	AA2 Democratization and mutual construction
Aa7: Differences in course participation Aa8: Differences in student abilities Aa9: Bidirectional influence of atmosphere Aa10: Environmental impact relationship Aa11: Teacher reflection and improvement	AA3 elastic structure
Aa12: Low-level emotional connection Aa13: Cognitive impairment relationship	AA4 Low emotional connection
Aa14: One-way communication between teachers and students	AA5 Authoritative indoctrination
Aa15: Stereotyped teacher-student roles Aa16: Rigidity affects interaction	AA6 rigid structure
Aa17: Technical cooperation learning Aa18: Technology promotes communication	AA7 Proactively empower teaching
Aa19: Teaching relies on technology	AA8 Deep integration of technology
Aa20: High degree of technology application Aa21: Technology enhances teaching	AA9 Learning ecological elements
Aa22: Use of simple tools	AA10 Physical auxiliary tools
Aa23: Technology remains superficial	AA11 Shallow integration of technology
Aa24: The technical functionality is not strong Aa25: Technical auxiliary function	AA12 Teaching accessories
Aa6: Cultivation of embodied ability Aa26: Comprehensive development with embodiment: Aa25: Driven by practical cases	AA13 Embodied Augmentation
Aa8: Dynamic adaptation of teaching methods	AA14 Embodied collaboration
Aa7: Deteriorating classroom behavior Aa28: Weakening of emotional connection	AA15 Embodied collapse
Aa5: Abstracting into synonymy	AA16 Symbolic decompression
Aa32: Strengthening of technological intermediaries	AA17 Symbolic balance
Aa27: Theory divorced from practice	AA16 Symbolic overload

3.2. Axial Coding

In the process of open coding, the data is merely decomposed through labeling, preliminary conceptualization, conceptualization, and categorization. However, all these processes are conducted from an objective perspective, abstracting and distilling the data. The categories extracted are all independent of each other, and no exploration is made regarding the relationships among these categories (Shi & Qian, 2024). The goal of axial coding is to identify and establish logical connections between the independent categories generated in the open coding stage, and re-integrate them to form more explanatory main categories. By repeatedly sorting out the logical relationships among the 34 concepts, researchers analyze their causal relationships, situational relationships, strategic relationships, and phenomenological relationships, etc., establish organic connections between initial categories, and summarize more concise main categories. Eventually, the researcher condensed the 34 concepts into 18 categories and 6 main categories, namely, reciprocal symbiotic teacher-student relationship, authoritative mechanical teacher-student relationship, instrumental participation, ecological participation, embodied practice, and symbolic abstraction. The logical relationships between the main categories and the categories, as well as the concepts of each category, are shown in **Table 5**.

Table 5. Main axis coding.

Main Category	Category	Concept
Mutually Beneficial and Symbiotic Teacher-Student Relationship	High-Emotional Bonding	Teacher-student emotional bonding, deepening of harmonious relationships
	Democratic Inter-construction	Collaborative two-way empowerment, trust-driven development, two-way inspiration between teachers and students, ideal model construction
	Elastic Structure	Differences in curriculum participation, differences in students' abilities, two-way influence of atmosphere, environmental influence on relationships, teachers' reflective improvement
Authoritative and Mechanical Teacher-Student Relationship	Low-Emotional Bonding	Low-level emotional bonding, cognitive-hindering relationships
	Authoritative Indoctrination	One-way communication between teachers and students
	Rigid Structure	Solidification of teacher-student roles, rigid influence on interaction
Technical Instrumental Participation	Teaching Appendage	Weak technical functionality, technical auxiliary role
	Shallow Technical Integration	Technology stays on the surface
	Physical Auxiliary Tools	Use of simple tools

Continued

Technical Ecological Participation	Learning Ecological Elements	High degree of technology application, technology promoting teaching
	Deep Technical Integration	Teaching relying on technology
	Active Empowerment Application	Technology cooperating with learning, technology promoting communication
Embodied Practice Dimension	Embodied Enhancement	Cultivation of embodied abilities, all-round development of embodiment, practice-case driven
	Embodied Synergy	Dynamic adaptation of teaching methods
	Embodied Collapse	Deterioration of class-nature relationships, weakening of emotional bonding
Symbolic Abstract Dimension	Symbolic Decompression	Abstraction turning into near-meaning
	Symbolic Balance	Strengthening of technical intermediaries
	Symbolic Overload	Theory detachment from practice

3.3. Selective Coding

Selective coding is an analysis and induction based on axial coding to obtain core categories, and then link the core categories with other categories in the form of a storyline, and improve the core categories and their relationships (Luo & Hou, 2022). This paper refines the six main categories of “mutualistic symbiotic teacher-student relationship”, “authoritative mechanical teacher-student relationship”, “instrumental participation”, “ecological participation”, “embodied practice”, and “symbolic abstraction” into the core category of “teacher-student relationship in application-oriented undergraduate colleges”. Centering on the core category, a “storyline” as shown in **Figure 1** is ultimately constructed: the relationship between teacher-student relationship and technology application is a two-way interaction of “demand screening - reverse reshaping”, where technology is optimized based on the needs of teachers and students, and in turn reshapes the teacher-student relationship. This process echoes the research context in educational technology about the technology acceptance model and technology reshaping teaching practice; the teacher-student relationship and knowledge construction interact through “dynamic feedback - reverse stimulation”, and technology application and knowledge construction rely on the “reverse push - deep regulation” effect. An increase in the intensity of technology penetration will significantly affect the degree of embodiment in knowledge construction. When technology over-penetrates, it will hinder the embodiment process of knowledge construction, thereby promoting the teacher-student relationship to tend towards an authoritative mechanical model. This interactive relationship profoundly reflects the core view in social constructivist learning theory that knowledge is co-constructed in social interaction, as well as the concept in embodied cognition theory

that emphasizes the fundamental role of bodily experience in cognitive development; the mutualistic symbiotic demands between teachers and students will stimulate embodied cognitive needs, and these cognitive needs will in turn push technology to transform from simple penetration to subject-oriented practice. This mechanism clearly relates to the research in the field of technology-enhanced learning, especially the discussions on how technology mediates the cognitive process, supports contextualized learning, and promotes the development of practical abilities. Thus, a better dynamic interaction chain of “teacher-student relationship - technology application - knowledge construction” is formed, where the three elements interact and cycle, promoting the reconstruction of the teacher-student relationship.

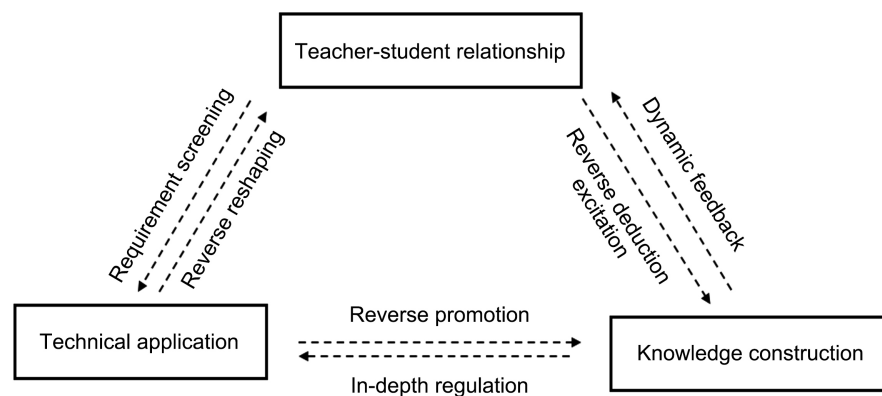


Figure 1. Dynamic interaction chain of teacher-student relationship - technical application - knowledge construction.

3.4. Saturation Test

Supplementary interviews with 2 students and 4 teachers were conducted. Following the original coding principles and procedures, no new concepts or categories emerged, confirming theoretical saturation.

4. Analysis of Improvement Paths for Teacher-Student Relationships in Applied Undergraduate Universities

4.1. Accelerate the Transformation of Tools and Deepen the Ecological Participation of Technology

At present, digital tools in the teaching process mainly play an auxiliary role, mainly serving as an extension of the senses. By improving the way knowledge is presented, they help teachers display content more intuitively and enhance students' learning experience. Take B College as an example. Platforms such as Cloud Class, Enterprise WeChat, and Rain Classroom are often used for classroom management and interaction. Teachers use them for attendance, conducting Q&A sessions, and interacting with students in class. However, the current use of these tools is still limited to the basic level of digital technology and has not broken free from the constraints of their tool-like nature. With the accelerated development

of the digital age and the deepening integration of technology and education, to improve the relationship between teachers and students, it is necessary to transform the role of technology in teaching, promoting its transition from tool-like participation to ecological participation. This will enable technology to be deeply integrated into teaching and become an indispensable part of the educational ecosystem (Cheng, 2025). This means that technology is no longer just an auxiliary means of teaching but becomes an intrinsic component and fundamental medium of the learning ecosystem, deeply involved in the cognitive process and relationship interaction, reshaping the interaction model between teachers and students, and ultimately achieving an intelligent transformation of the interaction model.

4.2. Strengthen Technology Empowerment and Balance the Dimensions of Embodied and Symbolic Knowledge Construction

The application of intelligent devices and virtual teaching platforms in the education field has become very common. While these technologies bring convenience to teaching, they also pose new challenges to students' cognitive development. If students rely too much on screens and virtual reality for learning, it will lead to a reduction in hands-on practice and personal experience. Without actual physical participation, knowledge is difficult to be effectively internalized or applied in real scenarios. When students learn through screens rather than on-site visits, their understanding of knowledge often remains at an abstract level rather than a personal and vivid experience, lacking real experience as support. Applied undergraduate colleges should strengthen technology empowerment in teaching and promote the organic combination of virtual learning and real operation. With the help of technology, students can engage in multi-sensory learning, operate equipment personally, and deeply immerse themselves in real situations to solve practical problems. This deep interaction between the body and the environment can help students transform abstract concepts in books into perceptible concrete experiences, thereby reconstructing their cognitive systems and ultimately achieving a dynamic balance in knowledge construction, cultivating applied professionals that meet industrial demands.

4.3. Enhance Emotional Connection and Build an Ideal Teacher-Student Relationship of Mutual Benefit and Symbiosis

In applied undergraduate colleges, there are currently multiple practical problems in the teacher-student relationship. Emotionally, there is a weak emotional connection between teachers and students, with a lack of in-depth understanding and trust between them, which makes it difficult to establish a healthy and good emotional bond. In terms of teaching models, some classrooms still follow an authoritative and didactic teaching approach, where teachers unilaterally transmit instructions to students through digital platforms, and students interact with teachers in a mechanical and emotionless manner, leading to a rigid classroom interac-

tion model (Man & Bi, 2024). To change this situation in applied undergraduate colleges, it is necessary to transform the teacher-student relationship from the traditional authoritative control model to a model of mutual benefit and symbiosis. Teachers showing concern for students' learning and life can effectively narrow the psychological distance between them. Teachers patiently answering students' learning questions and paying attention to the difficulties they encounter during growth can enhance emotional communication between teachers and students and encourage both to participate in the process of knowledge production and relationship building. At the same time, schools and teachers need to actively build a new teaching model where teachers and students participate together, changing the previous one-way knowledge transmission model and enabling the mutual transformation of the subject roles of teachers and students in the interaction process, ultimately achieving a state of mutual benefit and symbiosis for both parties.

5. Research Conclusions and Policy Recommendations

This study, based on the grounded theory research method, through the coding and analysis of interview data from teachers and students of B College, deeply explored the intrinsic connections among the six main categories of reciprocal symbiotic teacher-student relationship, authoritative mechanical teacher-student relationship, technical instrumental participation, technical ecological participation, embodied practice, and symbolic abstraction, and constructed a theoretical model. It was found that the main categories have a significant impact on the teacher-student relationship in application-oriented undergraduate colleges. This study also provides a new perspective and practical path for improving the teacher-student relationship in application-oriented undergraduate colleges under the background of digital intelligence empowerment.

5.1. Deepen Technological Empowerment and Enhance Students' Practical Abilities

Application-oriented undergraduate colleges should integrate more advanced technologies into teaching, such as promoting the application of VR training systems in teaching. Previously, teaching mainly relied on low-level technological means, which, although meeting basic teaching needs, still had limitations. VR training systems can simulate real environments for students, allowing them to perform virtual operations with VR devices as if they were on the spot, achieving a transition from low-level to high-level technologies. In engineering majors such as Mechanical Engineering, students can enter a 1:1 digitally replicated real CNC machine tool workshop in a VR environment and practice clamping operations using virtual tools. For example, after putting on VR devices, students can experience a workshop with real-model machine tools, use virtual wrenches, fixtures and other tools to complete the clamping of blank workpieces, and the system will also provide real-time error correction to help them master the correct operation

procedures. This helps broaden students' horizons, improve their professional skills, and enhance their practical application abilities, laying a solid foundation for their future career development (Ji, 2021).

5.2. Optimize the Curriculum Structure and Promote Students' Employment Adaptability

In the current curriculum system of application-oriented undergraduate colleges, the low proportion of practical courses leads to students' difficulty in applying the knowledge they have learned to practice. Therefore, application-oriented undergraduate colleges should increase the number of practical courses. In practical courses, students can apply the theoretical knowledge they have learned to solve practical problems, deepen their understanding of knowledge, and in this process, they will constantly explore new methods. In economics and management courses, students are guided to conduct simulated operations based on real enterprise projects, such as promoting new products in collaboration with cultural and creative stores. Students first apply market research theories to identify target customers' preferences through questionnaires and interviews, then design promotion plans using the 4P theory. If they face insufficient traffic during the process, they need to adjust publicity channels; if the budget is overspent, they have to optimize material costs. When students encounter difficulties, teachers only provide timely inspiration instead of directly giving answers. This integrates theory with practice and enhances students' adaptability which is conducive to cultivating students' innovative thinking abilities and practical problem-solving abilities, thereby greatly enhancing their embodied experiences. At the same time, practical courses can also allow students to accumulate practical operation experience, enabling them to quickly adapt to their jobs in the future.

5.3. Break Through Teaching Limitations and Jointly Build a Learning and Growth Community

In traditional classrooms, the one-way teaching model has obvious deficiencies. Teachers unilaterally impart knowledge, and students passively receive it. This model easily reduces students' learning enthusiasm and weakens the emotional connection between teachers and students. To improve the one-way communication problem, schools and teachers need to jointly create an interactive environment. Teachers should transform their educational concepts from "knowledge injectors" to "learning guides", encouraging students to think actively. In the classroom, interactive forms such as group cooperation and case analysis should be adopted to provide students with a platform to express their views. In programming courses for computer majors, teachers adopt problem-oriented teaching. Instead of directly explaining how to write code, they put forward specific tasks. Students need to first investigate the actual situation, split functional modules after group discussions, and then use tools like Python to write programs. When problems arise, teachers guide students to consult materials rather than directly

providing answers, making students the main body of the teaching process. This transformation not only improves the effectiveness of classroom teaching but also helps cultivate students' learning abilities and innovative thinking, establishing a harmonious and mutually beneficial teacher-student relationship.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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