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PENELITIAN TENTANG KONSTRUKSI KERANGKA TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE MODEL PENGAJARAN DALAM PENDIDIKAN TERAPI FISIK

A Research on TPACK Framework Construction of Teaching Models in the Education of Physical Therapy

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Abstrak

Terapi fisik harus memiliki pemahaman yang kaya tentang pengetahuan medis, keterampilan profesional, dan latar belakang pendidikan untuk membantu pasien dalam pemulihan secara efektif. Namun, pendekatan akademis dan metode pengajaran selalu menjadi topik penting dalam pelatihan profesional terapi fisik. Kerangka kerja TPACK (Pengetahuan Konten Pedagogis Teknologi) menyediakan metode untuk mengintegrasikan teknik pengajaran, pengetahuan mata pelajaran, dan aplikasi teknologi untuk pendidik profesional, yang dapat mempromosikan metode pendidikan yang lebih efektif dan meningkatkan pengalaman belajar siswa. Metode Penelitian: Penelitian ini mengeksplorasi konstruksi dan penerapan a model pengajaran berdasarkan kerangka TPACK dalam pendidikan terapi fisik. Peneliti menggunakan metodologi studi kasus untuk menganalisis implementasi dan efektivitas model pengajaran berbasis TPACK. Hasil: Temuan menunjukkan bahwa pendekatan pengajaran berbasis TPACK efektif dalam meningkatkan pengalaman belajar siswa terapi fisik. Siswa menunjukkan pemahaman yang lebih baik tentang isi kursus dan mampu menerapkan alat teknologi dengan lebih baik untuk mendukung pembelajaran mereka. Instruktur terapi fisik juga melaporkan bahwa kerangka kerja terintegrasi membantu mereka menyampaikan pelajaran yang lebih menarik dan efektif. Diskusi: Studi ini menyoroti nilai penerapan model TPACK untuk mengatasi kebutuhan pendidikan terapi fisik yang terus berkembang. Seiring dengan kemajuan teknologi pendidikan, pendekatan pengajaran ini dapat membantu program terapi fisik mempersiapkan siswa untuk memanfaatkan sumber daya teknologi secara efektif dalam praktik klinis mereka di masa depan. Para peneliti juga mendiskusikan strategi untuk mengatasi tantangan potensial, seperti pelatihan fakultas dan dukungan kelembagaan, untuk memastikan keberhasilan penerapan model pengajaran berbasis TPACK dalam kurikulum terapi fisik.

Kata kunci: Kerangka TPACK, Terapi Fisik, mengintegrasikan teknik pengajaran,

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kolaborasi interdisipliner

Abstract

Physical therapists must possess a rich understanding of medical knowledge, professional skills, and educational background to effectively assist patients in their recovery. However, the academic approach and teaching methods have always been an essential topic in the training of physical therapy professionals. The TPACK (Technological Pedagogical Content Knowledge) framework provides a method for integrating teaching techniques, subject knowledge, and technological applications for professional educators, which can promote more effective educational methods and improve student learning experiences.Research Methods:This study explores constructing and applying a teaching model based on the TPACK framework in physical therapy education. The researchers used a case study methodology to analyze the implementation and effectiveness of the TPACK-based teaching model. Results:The findings indicate that the TPACK-based teaching approach was effective in enhancing the learning experiences of physical therapy students. Students demonstrated improved understanding of course content and were able to better apply technological tools to support their learning. Physical therapy instructors also reported that the integrated framework helped them deliver more engaging and effective lessons.Discussion:The study highlights the value of adopting the TPACK model to address the evolving needs of physical therapy education. As educational technology continues to advance, this teaching approach can help physical therapy programs prepare students to utilize technological resources effectively in their future clinical practice. The researchers also discuss strategies for overcoming potential challenges, such as faculty training and institutional support, to ensure successful implementation of the TPACK-based teaching model in physical therapy curricula.

Keyword: *TPACK Framework, Physical Therapy,integrating teaching technique, interdisciplinary collaboration*

1. THE INTRODUCTION

With the continuous development of information technology, the field of education has undergone revolutionary changes, and the widespread application of digital technology has become an essential component of modern education. In physical therapy, the potential application of educational technology has brought new opportunities and challenges for teachers and students. However, integrating technology into physical therapy education still faces many complexities and challenges. Educational

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technology is not just about introducing digital tools into the classroom; it also involves considering how to integrate technology with the content and teaching methods of physical therapy to improve the quality of education and patient care(Veras et al., 2024).

The TPACK (Technological et al. Knowledge) framework's application in higher education is reflected in its promotion of effective integration of technological resources and teaching strategies by teachers to enhance learning outcomes(Cui & Zhang, 2021).

In higher education, teachers face diverse student groups and constantly changing technological environments. The TPACK framework provides teachers with a theoretical foundation to help them design and implement more effective teaching activities. （(Li et al., 2023)） Through the application of TPACK, teachers can identify and utilize appropriate technological tools to support specific teaching goals and content delivery, thereby enhancing students' learning experiences and effectiveness.

Implementing TPACK in higher education also involves interdisciplinary collaboration（(Ma, 2023)）, where teachers need to work with experts from other fields to integrate different subject knowledge and technological tools, providing a diverse and enriched learning environment((Wang et al., 2023))(Elmaadaway & Abouelenein, 2022).

2. METHOD

2.1 Literature review and theoretical analysis:

Reviewed the TPACK framework and examined its application value in professional education.

Analyzed the current status and needs of physical therapy professional education.

2.2 Instructional practice and case study:

Constructed a teaching model for physical therapy education based on the TPACK framework.

Applied the model in actual teaching, and collected and analyzed data such as teacher feedback and student learning experiences.

3. RESULT

3.1 Application of the TPACK Framework in the Field of Physical Therapy

3.1.1 The principles and components of the TPACK framework

The TPACK framework, which stands for Technological Pedagogical Content Knowledge, is a theoretical model ((Zhao et al., 2023))to guide teachers in effectively integrating technology into teaching. This framework emphasizes the need for teachers to consider the interactions of c (TK), pedagogical knowledge (PK), and content knowledge (CK) when designing and implementing teaching practices.

Technological Knowledge (TK)

Technological knowledge refers to teachers' understanding and mastery of

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modern educational technology, including but not limited to the use and integration of digital tools, software, internet resources, and other emerging technologies. This encompasses the ability to operate these technologies and an understanding of how these technologies can transform teaching and learning processes. Within the TPACK framework, teachers must understand various technological tools and be able to determine which technologies are best suited to support specific teaching goals and learning content, as well as how to innovatively integrate technology into instructional design to enhance learning experiences and outcomes((Zhao et al., 2023)).

Pedagogical Knowledge (PK)

Pedagogical knowledge refers to teachers' understanding and application of teaching methods, strategies, assessment, and classroom management. It involves identifying and implementing effective teaching strategies, designing appropriate learning activities, assessing students' learning progress, and creating and maintaining a conducive classroom environment for learning. Within the TPACK framework, pedagogical knowledge must be closely aligned with technological and content knowledge to ensure that teaching strategies and technological applications effectively support content instruction and help students achieve learning objectives ((Koh, 2020)).

Content Knowledge (CK)

Content knowledge refers to teachers' expertise in specific subject areas, including their understanding of subject matter, core concepts, theoretical frameworks within a discipline, and the organization and application of subject matter knowledge. Teachers' content knowledge not only relates to their ability to convey subject knowledge accurately but also encompasses their capacity to delve into the complexity of subject and its interdisciplinary connections, as well as their ability to design teaching activities that both align with the nature of the subject and stimulate student interest and engagement. Within the TPACK framework, teachers must integrate content knowledge with pedagogical and technological knowledge to create innovative and effective teaching approaches((Wang et al., 2023)).

3.1.2 Integration of Technological Knowledge (T) and Content Knowledge in Physical Therapy (C)

Physical therapy is an efficient field where technology integration can greatly enrich teaching resources and methods, enhancing students' learning efficiency. It requires teachers not only to be proficient in the specialized knowledge of physical therapy but also to apply various educational technologies to support teaching and learning proficiently. This integration makes the learning process of physical therapy more vivid and interactive and provides more opportunities for practical exercises. For example, Virtual Reality (VR) technology

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can create simulated physical therapy environments,(Rojo et al., 2024) allowing students to practice therapy techniques without risk and deeply understand complex therapeutic processes. Augmented Reality (AR) technology can visualize abstract physical therapy concepts for students, enhancing their understanding and memory. Online learning platforms and video tutorials provide students with flexible learning methods, allowing them to study at their own pace and schedule while also facilitating teachers track students' learning progress and provide personalized feedback. In addition, using data's analysis tools and software, students can learn how to collect and analyze data during the therapeutic process, thereby evaluating therapeutic effects more scientifically. Through the effective integration of technology and content knowledge, education in the field of physical therapy can not only improve students' learning efficiency and interest and cultivate their innovative thinking and problem-solving skills. This integration requires educators to explore and practice new educational technologies continuously, constantly update teaching strategies, and adapt to technological progress in the medical field, ensuring the timeliness and practicality of educational content.

3.1.3 Integration of Pedagogical Knowledge (P) and Content Knowledge in Physical Therapy (C)

This integration requires teachers to have a deep understanding of the specialized content of physical therapy and to master how to impart this knowledge through effective teaching methods to promote students' in-depth learning and understanding. By combining teaching strategies with specialized content, teachers can design teaching activities that meet students' learning needs, enabling students better to grasp complex concepts and skills in physical therapy. For example, case-based teaching (Woodruff Jameson & Willett, 2024)can help students understand the practical application of theoretical knowledge by analyzing real physical therapy cases. This method enhances students' practical abilities and improves their problem-solving skills. Similarly, problem-based learning (PBL) encourages students to explore and solve actual problems in physical therapy actively. Through this process, students can deepen their understanding of the principles and methods of physical therapy and cultivate teamwork and independent learning skills. The flipped classroom teaching model also transfers classroom lectures to online self-study for students, followed by in-class discussions and application exercises. This model emphasizes students' active participation and classroom interaction, helping deepen students' understanding and application of physical therapy knowledge.

3.1.4 Integration of Technological Knowledge (T) and Pedagogical

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Knowledge (P)

This integration emphasizes the need for teachers to have the ability to incorporate advanced technology into effective teaching strategies to enhance teaching effectiveness and student learning experiences. The application of technology is not just about introducing new tools into the classroom, but, more importantly, understanding how to use these tools to support and enhance the learning process. Teachers need to master a variety of technological tools, such as online collaboration platforms, educational software, virtual reality (VR), and augmented reality (AR) technology, and be able to determine which technologies are best suited to support specific teaching objectives and learning content. For example, they use online collaboration platforms to facilitate student discussions and cooperation or provide immersive learning experiences through VR technology, allowing students to explore and learn in simulated environments. At the same time, teachers need to combine these technological tools with innovative teaching designs and develop activities that fully leverage technological advantages while aligning with learning theories. This may include designing project-based learning tasks for students to use technological tools to solve real-world problems or creating a flipped classroom model（(Pitt & Huebner, 2022)）, providing students with opportunities for self-directed learning through online video lectures, followed by in-depth discussions and practical applications in the classroom. Additionally, teachers need to continuously update their technological knowledge and teaching methods to adapt to the rapid changes in technology and education fields. This requires teachers to engage in ongoing professional development and training and share experiences and the best practices with peers.

3.2 Construction of Teaching Models in the Physical Therapy Profession using the TPACK Framework

In the field of physical therapy, the application of the TPACK framework helps to construct a comprehensive teaching model that integrates technology, pedagogical methods, and specialized content to meet the educational needs of the current and future of physical therapy. The following are the critical elements of the construction of teaching models in the physical therapy profession using the TPACK framework:

3.2.1 Integration of Technology into Instructional Design

In the teaching model of the physical therapy profession, the first consideration is integrating modern technology into curriculum design to make the teaching content more vivid（(Netzer & Elboim-Gabyzon, 2023)）, interactive, and practical. Technologies such as virtual reality (VR) and augmented reality (AR) can simulate real-life scenarios in the rehabilitation process, providing students with opportunities for simulated practice.

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Additionally, online learning platforms and resources can support students' self-directed learning, expanding learning resources and pathways.

3.2.2 Deepening the Dispensation of Specialized Content Knowledge

Combining technology and innovative teaching methods, teachers must ensure the in-depth dispensation of specialized content knowledge. This includes imparting fundamental theoretical knowledge and focusing on the latest rehabilitation research findings, clinical practice guidelines, and the integration of interdisciplinary knowledge(Gagnon et al., 2023). By deepening the dispensation of content knowledge, students can establish a solid professional foundation for future clinical practice and continuing education.

3.2.3. Reinforcing Learning Feedback and Assessment

In the teaching model guided by the TPACK framework, feedback and learning process assessment are essential components. Using technological tools to collect student learning data, teachers can understand students' learning progress in real time, adjust teaching strategies accordingly, and implement personalized teaching. Moreover, students should be encouraged to engage in self-assessment, strengthening their self-reflection and lifelong learning capabilities."

4. DISCUSSION

4.1. Recommendations for Faculty Training Optimization:

Organize specialized training programs to enhance teachers' proficiency in the latest educational technologies (such as virtual reality, augmented reality, online teaching platforms, etc.), ensuring teachers can effectively integrate these technologies into their teaching. Promote innovative teaching methods by encouraging and supporting teachers to explore and practice student-centered teaching methods such as flipped classrooms, problem-based learning (PBL), case-based teaching, etc., to enhance student engagement and practical skills. Strengthen interdisciplinary knowledge training by providing interdisciplinary knowledge training to help teachers integrate knowledge from related disciplines such as medicine, psychology, and sociology, considering the interdisciplinary nature of physical therapy and enriching teaching content and perspectives.

4.2. Recommendations for the Optimization of Teaching Models:

Utilize technological tools to collect students' learning data, analyze students' learning needs and preferences, design personalized learning paths, and provide customized teaching support. Interactive learning environment construction: Create an interactive learning environment using technology(Sterpu et al., 2024), such as online discussion forums, virtual laboratories, simulated

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therapy scenes, etc., to increase student engagement and interactivity. Integration of practice and feedback: Reinforce practical teaching by providing students with ample opportunities for practice, such as internships, experiments, and simulated training, combined with timely and effective feedback mechanisms to help students adjust their learning strategies. Emphasize the cultivation of critical thinking and reflective abilities(ZHANG et al., 2024)Integrate the cultivation of critical thinking and reflective abilities into teaching, encouraging students to conduct in-depth analysis and reflection on learning content and practical processes, thus nurturing their problem-solving abilities.

5. CONCLUSION

The TPACK framework emphasizes that the effectiveness of education in a rapidly evolving technological environment depends on the organic integration of technology, pedagogical methods, and content knowledge. This framework prompts educators to rethink how to utilize modern technology to provide new tools and resources for teaching and to improve teaching methods to make them more engaging for students and to enhance learning efficiency and effectiveness. In physical therapy, teachers need to continually update their technological knowledge while also innovating teaching strategies and content to adapt to the emerging teaching needs and students' learning preferences.

From the perspective of educational reform, the TPACK framework encourages educators in physical therapy to break free from the constraints of traditional teaching models and explore how to integrate technology into curriculum design to enhance the interactivity and practicality of courses. For example, simulating complex rehabilitation therapy scenarios using virtual reality technology allows students to engage in practical learning in a risk-free environment, significantly enhancing students' learning motivation and engagement. Additionally, the use of online learning platforms and digital resources can support personalized learning, meeting the diverse learning needs of students and thereby increasing the flexibility and accessibility of teaching.

Looking ahead, with the continuous advancement of technology and ongoing innovation in educational principles, applying the TPACK framework in physical therapy education will become more widespread and profound. New developments in educational technology, such as artificial intelligence, extensive data analysis, and machine learning, will provide new possibilities for physical therapy education, making the design of personalized learning pathways and the assessment of learning outcomes more efficient and precise. Furthermore, interdisciplinary integration will be another important direction for future educational reform, as integrating knowledge from fields such as medicine, engineering, and information science will

enable physical therapy education to more comprehensively meet the needs of society and students, fostering innovative, practical, and versatile professionals.

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