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*Research Article*

# Exploring educational technology, online communities, and self-paced learning in enhancing graduate students' health promotion skills in physical education

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This study explores the interplay between educational technology adoption, online community participation, self-paced learning, and graduate students' health promotion skills in physical education programs. It investigates how these factors facilitate or hinder skill development by examining teaching techniques and interventions in graduate education. Using a qualitative approach, semi-structured interviews were conducted with 18 graduate students until thematic saturation was reached. Narratives were analyzed through a three-step thematic analysis to uncover relationships and insights. Findings reveal that educational technology enhances health promotion abilities, while online communities present both opportunities and challenges. Self-paced learning was found to empower students, highlighting the importance of guidance in the learning process. The study identifies a nuanced structure within educational technology that supports graduate students' well-being in physical education programs. By examining the connections between health promotion skills and educational strategies, this research advances understanding of health education programs. The integration of theoretical and empirical insights provides practical recommendations for educators, policymakers, and practitioners. These findings offer valuable perspectives on how technological factors shape graduate education, contributing to academic discourse and promoting student well-being.

Keywords: Educational technology adoption; Online community engagement; Self-paced learning; Health promotion skills; Learning engagement

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## 1. Introduction

Higher education is evolving through the integration of self-paced learning, educational technologies, and online communities. For physical education graduate programs, these changes present both opportunities and challenges. As educational frameworks shift, it becomes increasingly important to explore the intricate connections between educational features and student well-being (Freeland et al., 2022). This study investigates how educational technology, student engagement, self-paced learning, and health promotion impact graduate students' health promotion skills in physical education programs. These factors create a dynamic learning

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environment, warranting detailed exploration to inform teaching strategies and deepen understanding of students' academic and health-related experiences. Set against the backdrop of graduate education's growing reliance on technology, this research examines the implications of interactive software, online platforms, and virtual simulations for learning (Roopa et al., 2021). Additionally, virtual communities have reshaped student interactions with academic content and peers, fostering opportunities for collaborative knowledge-building. Self-directed learning, which grants students greater autonomy over their education, has also gained prominence (Ruiz-Alonso-Bartol et al., 2022). The importance of engagement as a mediator between positive learning outcomes and well-being is well-documented (Olivier et al., 2019). This study aims to dissect the complexities of this evolving educational ecosystem and its implications for physical education graduate students.

Numerous research has extensively explored educational technology adoption, online community engagement, self-paced learning, and learning engagement. Studies show that instructional technology enhances learning outcomes (Sabiri, 2020), while online communities promote collaboration, information sharing, and a sense of belonging. Self-paced learning fosters autonomy and personalized education (Wiziack & dos Santos, 2021). Learning engagement, a key factor in academic success, is strongly correlated with positive learning outcomes. However, current research has not adequately analyzed these elements within graduate physical education programs. For instance, educational technology has been shown to enhance student motivation, engagement, and performance (Lee & Fanguy, 2022), while online communities provide social support, collaborative learning opportunities, and shared identity (Ihl et al., 2020). Self-paced learning improves autonomy, intrinsic motivation, and content mastery (Danişman et al., 2023; Sapancı & Güler, 2021; Tullis & Benjamin, 2011). Learning engagement is positively linked to academic performance, student motivation, and overall well-being. Despite these findings, the interplay between these factors in graduate physical education programs remains underexplored. Prior research has often examined these aspects in isolation, overlooking their complex relationships. To address this gap, this study evaluates the synergies and conflicts among these factors and their impact on graduate students' health promotion skills. The study builds on Santana-Monagas et al. (2022), who emphasize the diverse nature of student experiences in higher education, and Cassidy et al. (2023), who advocate for a broader concept of student well-being beyond academics. By systematically examining educational experiences—integrating technology adoption, community involvement, and self-directed learning—this research provides a holistic perspective on their influence within graduate physical education programs.

This research aims to understand the complex relationships between educational technology adoption, online community engagement, self-paced learning, and health promotion among graduate students in physical education programs. The study examines how factors affect health promotion competency development using a holistic approach. This project aims to understand the linked dynamics of current graduate education to find solutions to improve academic performance and well-being. This research will provide graduate physical education program interventions and teaching methods. This study enhances student development by linking health promotion skills to schooling. This study's conclusions are important for professionals, legislators, and educators who want to improve technology integration, online user experience, and self-paced learning. Establishing a framework based on these findings can yield practical academic and health improvement recommendations. The study's findings apply to current higher education beyond its context.

## 2. Literature Review

Technology is transforming higher education, affecting students' academic experiences like never before. Researchers say this transformation is not linear but influenced by several factors. According to Robinson and Persky (2020), educational technology adoption depends on a complex interaction between human viewpoints, institutional support, and technology capabilities. Higher

education institutions can recognize technological integration's complexity and dynamic nature using this multidimensional approach. Additionally, online networks have enabled students to collaborate and communicate in new ways, fostering a sense of inclusion and active engagement in digital spaces. Mompoint-Gaillard et al. (2022) stress the value of online communities in supporting learners. In technology-based education, a community enhances learning, emphasizing the importance of social participation. Independent learning reasons, tendencies, and obstacles become more significant as students traverse self-directed learning environments. In their study on self-directed learning, Wiziack and dos Santos (2021) explain how students navigate and change their academic courses. Self-paced learning environments emphasize student autonomy, therefore students must be aware of the elements that influence their educational choices and future challenges. The study also emphasizes the importance of health promotion skills in student growth and the role of self-directed learning, online communities, and educational technology. Joubert and Reid (2023) studied how online communities and instructional technology can increase student well-being. This comprehensive approach recognizes that health promotion abilities are developed outside of regular education and online. Understanding student participation in learning complicates the story. Emotions and active participation are key to technology-mediated learning. Laakso et al. (2021) examine the emotional aspects of learning engagement, highlighting the importance of motivations and emotions. Online communities and educational technology platforms improve learning quality and depth.

Education technology studies have evaluated student digital tool and platform use. According to Harmandaoğlu Baz et al., (2018), qualitative research is crucial for comprehending students' educational technology viewpoints. This qualitative approach and student experiences explain academic technology integration. This study indicated contextual variables impact school technology integration (Wang & Ofstad, 2021). Technology, institutional support, and good training aid; digital divide, technical incompetence, and change resistance hinder. These traits show that technology must be carefully and contextually integrated to help students in varied learning situations. The qualitative investigation extends beyond student gadget use. Technology's symbolic, personal, and utilitarian implications are examined. Technology empowers some students by providing resources and information. Technology can overstimulate anxious people. Understanding students' subjective views helps build instructional technology projects that match their goals, interests, and learning styles. Culture, culture, and circumstance affect student tech use. The "digital divide" concerns digital literacy and access issues. Ochieng et al., (2023) argue addressing these gaps promotes diversity in educational technology initiatives. Students interpret technology differently by culture. Education and tech culture affect digital tool use. COVID-19 and worldwide online learning have transformed pupils' technology utilization. The rise of online education has led to digital tiredness, screen time, and the need for new instructional methods to interest pupils. Understanding how globalization is affecting technology-mediated education is essential for successful and long-lasting interventions.

Benoit et al. (2023) found instructional technology improves student health. Their research reveals that instructional technology greatly improves students' access to tools, interactive resources, and health information. Tharalson et al. (2023) suggest this enhances health-promoting activity understanding and holistic well-being. Technology-based education encourages health (Khogali & Mekid, 2023). Digital technology is needed in health education nowadays. Researching internet networks and student health. Online communities and student health were studied by (Almutairi et al., 2022). The study showed that virtual platforms can teach youngsters about health and build wellness clubs. Virtual communities allow students to exchange information, participate in health activities, and have engaging conversations, according to Reinhardt et al. (2023). Online community foster health, unity, and education (Dash et al., 2022). Understanding how online communities impact student health helps us understand how digital platforms may support all-encompassing learning goals and enhance student health in modern classrooms. Self-paced learning's health advantages confuse education research. One study found that educational paths

affect physical health. Self-paced learning helps students develop healthy habits and manage their education. According to Robinson and Persky, (2020), self-directed learning increases time management and health knowledge. Teachers can adjust lectures to students' academic and health goals by understanding how self-paced learning influences health promotion abilities. Environment becomes student-friendly. One must study the complex relationships between self-paced learning, online communities, educational technology adoption, and students' health promotion skills to understand learner engagement. Online communities, self-directed learning, and educational technology engage students (Ruiz-Alonso-Bartol et al., 2022). This complex network emphasizes the importance of understanding how education influences student engagement and well-being. As education adapts to students' needs and goals in a technologically enhanced and globally connected environment, this holistic approach is more important than ever. Active learning impacts student health promotion. Scholars like lively, engaging, emotional learning. Student learning engagement influences health skill acquisition and application, according to Tam et al. (2023). Mediating learning engagement reveals how education affects children's development, including classroom health.

## 3. Method

### 3.1. Research Design

This study employs a qualitative research design, focusing on understanding the complex interplay between educational technology adoption, online community engagement, self-paced learning, and students' health promotion skills. The qualitative approach was chosen to capture the depth and richness of participants' experiences and to explore the subjective meanings they assign to these educational dimensions.

### 3.2. Participants

Eighteen graduate students enrolled in various physical education programs were purposefully selected for participation in this qualitative study. The selection aimed to ensure diversity in terms of educational backgrounds, levels of engagement with educational technology, online communities, and experiences with self-paced learning (see Table 1). Participants were recruited through targeted invitations sent via email, and those who expressed interest in the study were provided with detailed information about the research objectives and procedures.

### 3.3. Data Collection

Semi-structured interviews were chosen as the primary method of data collection to allow for in-depth exploration of participants' perspectives and experiences. The interviews were conducted face-to-face or via virtual platforms based on participant preferences. Before each interview, participants were informed about the study's purpose, assured of confidentiality, and provided with an opportunity to ask questions. Informed consent was obtained from all participants. Interview questions were designed to elicit rich narratives regarding their adoption of educational technology, engagement with online communities, experiences with self-paced learning, and the perceived impact on their health promotion skills (see Table 2). The interviews were conducted by the lead researcher and were audio-recorded, with participants' consent, to facilitate accurate data capture. Data collection continued until saturation was achieved, a point at which no new themes or insights were emerging from successive interviews. Saturation ensured that the study comprehensively captured the range and diversity of participants' experiences within the defined scope.

Table 1
*Characteristics of the Participants*

| *Participant ID* | *Gender* | *Age* | *Academic Program* | *Level of Technology Adoption* | *Online Community Engagement Level* | *Self-Paced Learning Experience* | *Duration of Participation* |
|---|---|---|---|---|---|---|---|
| P001 | Female | 26 | Master's in PE | High | Moderate | Yes | 2 years |
| P002 | Male | 30 | PhD in SS | Moderate | High | No | 3 years |
| P003 | Female | 28 | Master's in PE | Low | Low | Yes | 1.5 years |
| P004 | Male | 32 | Master's in ET | High | High | Yes | 2.5 years |
| P005 | Female | 25 | Master's in PE | Moderate | Low | No | 1 year |
| P006 | Male | 29 | PhD in SS | Low | Moderate | Yes | 2 years |
| P007 | Female | 27 | Master's in ET | Moderate | High | Yes | 2 years |
| P008 | Male | 31 | Master's in PE | High | Moderate | No | 1.5 years |
| P009 | Female | 28 | Master's in ET | Moderate | Low | Yes | 2.5 years |
| P010 | Male | 33 | PhD in SS | Low | High | Yes | 3 years |
| P011 | Female | 26 | Master's in PE | High | Moderate | Yes | 2 years |
| P012 | Male | 30 | PhD in SS | Moderate | High | No | 3 years |
| P013 | Female | 28 | Master's in PE | Low | Low | Yes | 1.5 years |
| P014 | Male | 32 | Master's in ET | High | High | Yes | 2.5 years |
| P015 | Female | 25 | Master's in PE | Moderate | Low | No | 1 year |
| P016 | Male | 29 | PhD in SS | Low | Moderate | Yes | 2 years |
| P017 | Female | 27 | Master's in ET | Moderate | High | Yes | 2 years |
| P018 | Male | 31 | Master's in PE | High | Moderate | No | 1.5 years |

*Note.* PE: Physical education; SS: Sport sciences; ET: Educational technology.

Table 2
*Interview Guidelines*

| *Variable and Interview Guideline* |
|---|
| Educational Technology Adoption |
| 1. Can you describe your experience with incorporating educational technology in your academic pursuits? |
| 2. What motivated you to adopt specific educational technologies? |
| 3. Were there any challenges or obstacles you encountered in integrating technology into your learning? |
| 4. How do you perceive the impact of educational technology on your overall educational experience? |
| Online Communities |
| 1. Can you share your experiences of engaging with online communities related to your studies? |
| 2. How do these online communities influence your learning experiences and collaborative knowledge construction? |
| 3. In what ways do you feel a sense of belonging within these digital spaces? |
| 4. How have online communities contributed to your overall engagement in your academic journey? |
| Self-paced Learning |
| 1. Can you describe your motivations for engaging in self-paced learning? |
| 2. What preferences do you have regarding self-paced learning, and how do you navigate the flexibility it offers? |
| 3. What challenges, if any, have you faced in managing your time and responsibilities within self-paced learning? |
| 4. How do you perceive the impact of self-paced learning on your autonomy and overall educational experience? |
| Students' Health Promotion Skills |
| 1. Can you share your perceptions and experiences related to health promotion skills within your academic journey? |
| 2. How do you believe educational technology adoption influences your ability to promote your health? |
| 3. In what ways do online communities contribute to your understanding and practice of health promotion skills? |
| 4. How has self-paced learning impacted your overall well-being and ability to engage in health-promoting behaviors? |
| Learning Engagement |
| 1. Can you describe your active participation, motivation, and emotional experiences in the learning process? |
| 2. How do you perceive learning engagement as a mediator between educational technology, online communities, self-paced learning, and health promotion skills? |
| 3. Can you share specific instances where your engagement in educational technology, online communities, or self-paced learning positively influenced your health-related behaviors? |
| 4. How do you view the intricate connection between your overall engagement in the learning process and the development of health promotion skills? |

### 3.4. Data Analysis

A three-step thematic analysis process guided the examination of the collected data (see Table 3). In the first step, researchers familiarized themselves with the data by repeatedly reading and immersing themselves in the interview transcripts. This facilitated a deep understanding of participants' narratives and context. The second step involved generating initial codes to identify patterns and themes related to educational technology adoption, online community engagement, self-paced learning, and the development of health promotion skills. The coding process was iterative, with researchers refining and adjusting codes as new insights emerged. In the concluding phase, themes were incorporated into a narrative to show participants' experiences and link educational dimensions to health promotion skills. Multiple researchers collaborated on the analysis to improve reliability and validity.

Table 3
*Details of Thematic Analysis*

| *Stages and Activities* | *Description* |
|---|---|
| Stage 1: Familiarization with Data | |
| Repeated Reading of Transcripts | Researchers thoroughly reviewed interview transcripts to understand participants' experiences. |
| Initial Note-Taking | Preliminary notes were made to capture initial impressions, identify recurring patterns, and highlight noteworthy quotes or themes. |
| Generating Initial Codes | Key concepts, terms, and themes around educational technology adoption, online communities, self-paced learning, and health promotion skills were coded. |
| Stage 2: Generating Initial Codes | |
| Open Coding | The transcripts were systematically coded using an open-coding approach, where researchers identified and labeled patterns, concepts, and themes emerging from the data. |
| Creating Codebook | A codebook standardized coding, assuring researcher uniformity and aiding methodical analysis. |
| Group Discussions | Regular team discussions were conducted to review and refine codes, ensuring a shared understanding of emerging themes and resolving any discrepancies in coding. |
| Stage 3: Theme Development and Refinement | |
| Identifying Themes and Patterns | Collaboratively reviewing coded data, researchers discovered themes and examined educational characteristics and health promotion abilities. |
| Creating Sub-Themes | Sub-themes were identified within larger thematic categories, allowing for a nuanced exploration of participants' experiences and perceptions. |
| Iterative Analysis and Revision | Iterative thematic analysis refined topics based on data analysis and study team conversations. |
| Triangulation of Findings | Triangulation techniques, including member checking and comparing findings with existing literature, were employed to enhance the validity and reliability of the results. |

Researchers used reflexivity to identify and mitigate biases throughout the study process. Regular team talks addressed prejudices that might affect data interpretation. Participant verification was done by giving them a summary of significant findings to confirm or contribute to the results, assuring accuracy and trustworthiness.

## 4. Findings and Discussion

The outcomes of this qualitative study show the complex relationships between educational technology, online communities, self-paced learning, learning engagement, and students' health promotion skills. Eighteen semi-structured interviews revealed participants' different experiences and perspectives. This allowed us to extensively investigate how educational components affect health outcomes. The study examined the impact of online communities, educational technology, self-paced learning, and learning engagement as a mediator on students' health promotion skills. Qualitative methods allowed researchers to examine individuals' real-life experiences. This clarified the pros and cons of different educational traits. The results presentation uses participant narratives and previous research to show the complex relationships between health promotion skills, online community engagement, self-paced learning, and educational technology adoption in learning engagement. All participants' perspectives help explain how these factors affect physical education graduate students' educational and health paths.

### 4.1. Educational Technology Adoption Influences Students' Health Promotion Skills

The thematic analysis of participant responses shows a complex relationship between educational technology usage and students' health promotion skills (see Table 4). The stories demonstrate a common theme: instructional technology can improve students' comprehension and engagement in health-promoting actions. Participant P004 emphasizes how educational technology improves health information accessibility. Participant claims that instructional technology's accessibility and motivational aspects have helped them establish good daily habits. Online platforms can provide interactive tools that exchange health information and stimulate active well-being, according to participant P011. Educational technology analysis helped this person understand how to improve their health and incorporate good behaviors into their daily routine. Academic literature supports the above claims, including Morosky et al. (2022) claim that technology in health education programs can improve students' comprehension and encourage a more holistic approach to well-being. Liebermann et al. (2022) highlighted that digital technologies are interactive, which matches research participants' experiences. This suggests that instructional technology can boost health promotion. Thematic analysis illuminates' participants' complicated perspectives, improving debate. P008 worries about technology's effects on health. The participant acknowledges the challenges of overusing digital media and screen time. This data supports Castonguay et al. (2023), which emphasizes the importance of assessing potential negative effects of technology in health education. Growing use of technology in school raises issues about how to balance digital learning benefits with mental and physical wellness. Robinson and Persky (2020) stress the necessity for screen-use reduction methods. As educational technology is integrated into learning, the need to overcome digital participation hurdles is expanding. Technology adoption benefits should not outweigh its negatives. Comprehensive methods that address participant concerns are needed to optimize educational technology's health promotion potential. This may require restrictions to ensure ethical technology use, such as scheduling physical activity breaks in online learning environments and creating a digital learning environment that promotes holistic well-being. Educators, health professionals, and technology developers must work together to improve educational technology's benefits and minimize its problems.

Table 4
*Themes on How Educational Technology Adoption Influences Students' Health Promotion Skills*

| *Themes / Findings* | *Weightage (Importance)* |
|---|---|
| Positive Impact of Technology on Health Awareness | High |
| Challenges in Balancing Technology and Healthy Habits | Moderate |
| Need for a Balanced Approach | Moderate |

### 4.2. Online Communities Influences Students' Health Promotion Skills

The qualitative study analyzes how online communities affect student health promotion skills. This is a complicated network of experiences and perspectives that show how digital surroundings change health attitudes. In the study, participants discussed the benefits of virtual health communities and the challenges of interpreting information in such contexts (see Table 5). Participant P017 emphasizes the impact of online health communities on individuals, stating that their active participation has given them vital knowledge and a diverse perspective. He explained, "I engaged in healthy activities and shared my experiences, motivated by the friendships I had formed." Participant P006 stated: "The cooperative nature of online communities fosters a welcoming environment." Sharing information and experiences has taught me how to enhance my health regularly. The literature reflects the dominant view. Dugartsyrenova and Sardegna (2022) emphasizes the value of online communities as platforms for health promotion, highlighting their capacity to facilitate knowledge sharing, provide social support, and motivate individuals. Freeland et al. (2022) work underlines the value of online communities in fostering a sense of community and shared health-related goals. Digital settings that encourage collaborative learning seem to improve health awareness and behavior. However, the report highlights online community engagement challenges. Participant P012 says online communities offer insights but make it hard to spot bogus information and conflicting recommendations. Today's digital age, with its plethora of information, makes it crucial to identify trustworthy sources and assess health-related content. Paparova et al. (2023) supports the study's findings on difficulty engaging online communities. Digital health environments should encourage evidence-based practices, according to their research. Disinformation can limit the benefits of online communities, so evidence-based decision-making must be prioritized. Due to these challenges, digital health literacy initiatives are necessary. Scholarship programs from universities and public health organizations can educate online health forum content analysis. Community guidelines that encourage responsible health information sharing and emphasize verified sources can help digital conversations incorporate evidence-based practices. The study also details the intricacies of virtual health communities and how individual perspectives and experiences affect them. Understanding these groups' perspectives can assist create tailored solutions that match their members' requirements and preferences. Customized health promotion techniques that use online communities' supportive and collaborative character may do more to promote favorable health outcomes.

Table 5
*Themes on How Online Communities Influences Students' Health Promotion Skills*

| *Themes / Findings* | *Weightage (Importance)* |
|---|---|
| Positive Impact of Community Engagement on Health | High |
| Challenges in Navigating Information | Moderate |
| Importance of Digital Health Literacy Skills | Moderate |

### 4.3. Self-paced Learning influences Students' Health Promotion Skills

The qualitative study on self-paced learning and students' health promotion capacities found a complex link between self-directed learning and well-being. Participant P003 said self-paced learning helped them manage their academic and personal lives. Autonomy let me study health topics and make positive adjustments. As P014 said, "The inherent adaptability of self-paced learning empowered me to shape my own educational path, integrating relevant subjects related to health. It encouraged me to investigate non-academic areas and promote proactive self-care." Dugartsyrenova and Sardegna (2022) revealed how self-paced learning may boost motivation, self-confidence, and educational autonomy. Liao and Wu (2023) underlined the benefits of learner autonomy in self-paced contexts, which matches the participants' sense of autonomy while doing independent health investigations. Participants worried about the drawbacks of self-paced health promotion learning. Despite its flexibility, self-paced learning requires excellent time management,

according to participant P009. Balancing health and academic goals is difficult. In self-directed learning, time management skills are crucial, according to (Wyllie et al., 2021). Tam et al. (2023) emphasizes the need of scaffolding and support in ensuring that self-paced learning improves well-being. These findings demonstrate the complex relationship between self-paced learning and health promotion skills. According to the topic analysis, self-paced learning allowed people to tailor their education to their health goals. P018 stated, "Having the opportunity to learn at my own pace allowed me to focus on health-related topics that deeply interested me. I can independently study nutrition, mental health, and exercise." Shin et al. (2023) found that personalized self-paced learning to individual interests and needs is important. Al Chibani (2019) also stress the relevance of learner-centered methods for intrinsic motivation. Participants' self-directed learning experiences are used to integrate health-promoting knowledge into their educational program. The qualitative findings show that self-paced learning enhances students' health promotion skills by letting them control their academic journey. The ability to tailor educational experiences to students' health interests empowers them to incorporate wellness behaviors into their studies. Participants emphasize the need of time management and self-directed learning balance to increase well-being. The study illuminates the complex relationship between educational quality and students' health promotion views. Participants' views show the complex relationship between self-paced learning and health promotion competences. Self-paced learning promotes liberty and personalizes education. This needs careful time management and balance. The study adds to self-paced learning research and has practical implications for institutions and educators seeking to improve student development through individualized learning.

Table 6
*Themes on How Self-Paced Learning Influences Students' Health Promotion Skills*

| *Themes / Findings* | *Weightage (Importance)* |
|---|---|
| Empowerment through Self-paced Learning | High |
| Challenges in Consistent Engagement | Moderate |
| Emphasis on Effective Time Management | Moderate |

### 4.4. Learning Engagement as a Potential Mediator

The qualitative research found that learning engagement is a mediator between students' health promotion abilities, online communities, e-learning, and self-paced learning. Participants' narratives stressed the necessity of learning engagement in developing these characteristics' complex interrelationships. Participant engagement in learning pushed them to integrate educational technology in their health promotion activities. Participant P003 said, "Through active engagement with technologically enhanced materials, the learning experience became more dynamic. The event made me curious in health promotion and motivated me to learn more." Participant P013 emphasized the importance of learning engagement communities as a mediator, saying "…Active involvement in online communities offered a platform for continuous education." Participating helped me use my knowledge and improve my health. Wang and Ofstad (2021) agrees that learning engagement is crucial to educational technology's success. Huang and Yuan (2024) emphasize the value of online communities in facilitating information application and supporting members' opinions. Participants also examined how self-paced learning, especially with high participation, made health-promoting skills easier to develop. Participant P009 said self-directed learning personalized their health education. Promoting self-governance in progress speed improved my health understanding and integration into my daily routine. This was also held by P018. "To effectively participate in self-paced learning, it was imperative to not only understand but also actively apply the material. This improved health promotion capacities." Krautscheid et al. (2022) encourages student engagement in self-directed education, supporting these findings. Dugartsyrenova and Sardegna (2022) also emphasizes the importance of self-

directed learning, which can improve information understanding and application, supporting participant testimonies. As a mediator, learning engagement linked e-learning, online communities, and self-paced learning to students' health promotion abilities. Participant P007 noted that active engagement in online community's links technology adoption, online community interactions, and self-paced learning. The approaches of these instructional components improve health promotion abilities. P015 stressed, "Engagement acts as the unifying factor that connects the various aspects of my academic journey. I know each part will help me grasp health promotion and its practical applications." Based on these findings, Kim et al. (2020) stresses active engagement as a mediator in the complicated relationship between numerous educational characteristics. The participants' claims are confirmed by Hamad et al. (2021), who stress the interdependence of educational experiences and the importance of learner engagement in bridging varied features. Participants struggled to maintain learning engagement. "Achieving equilibrium in engagement across various educational dimensions can pose a challenge," said the participant. I can't always immerse myself because of other obligations. Stephenson et al. (2022) agrees that maintaining engagement in several educational environments may be tough. Calik et al. (2022) emphasizes the need of support systems in promoting learner engagement, echoing participant worries about potential obstacles.

Table 7
*Learning Engagement as a Potential Mediator*

| *Themes / Findings* | *Weightage (Importance)* |
|---|---|
| Active Engagement as a Catalyst | High |
| Challenges in Sustaining Consistent Engagement | Moderate |
| Importance of Intentional Strategies | Moderate |

## 5. Concluding Remarks

The discussion portion of the study paper analyzes online communities, graduate physical education programs, educational technology adoption, self-paced learning, learning engagement, and health promotion skills. This thorough study aims to elucidate the complex dynamics of these processes and reveal the intricate links between technology, community involvement, self-directed learning, and health education participation. The study examines the effects of educational technology in health education, supporting previous research on its benefits. Joshi and Kanoongo, (2022) say that interactive educational platforms increase students' participation and make it easier for them to acquire health-related information, and their findings are congruent with this. By providing students with a wide range of health information, educational technology can help overcome geographical barriers. The findings underline the need for a balanced perspective that understands the challenges of increased screen use and its potential for physical and mental health harm. This advanced approach emphasizes the need of combining technology with health and well-being issues and advocating for a balanced and harmonious interaction between technology and welfare. The study adds to the literature on peer relationships' benefits in digital environments, particularly online groups. Habibi et al. (2019) claim that online community engagement improves health promotion capacities because these networks enable information and support exchange. Students can exchange health education opinions, ideas, and resources in online groups. The research shows that online communication may provide a caring environment but also make it difficult to evaluate information and propagate misleading information. This highlights the necessity for digital literacy initiatives to help students critically evaluate online material.

This study reinforces the scientific debate on self-paced learning's emphasis on individualized education and freedom. Participants' narratives confirm Zhoc and Chen (2016) who claim that self-directed learning fosters agency and autonomy. Self-paced learning lets students customize their education to their needs and interests. The research goes further by finding issues with constant

engagement and time management. Learning autonomy is appreciated, but it demands judicious self-regulation. This sophisticated method makes self-paced learning in health education more practical. It highlights that letting students study at their own pace raises certain concerns that must be addressed. Academic institutions should provide students with the tools and assistance they need to navigate self-paced learning. This research requires learning engagement as an intermediary to analyze interactions. Students' experiences with educational technology, online communities, and self-paced learning reveal how this promotes the development of health promotion skills. Mizani et al. (2022) confirmed that learning engagement mediates positive learning outcomes. Academic involvement improves students' critical thinking, problem-solving, and health promotion knowledge. The research provides context-specific insights and shows how educational domains affect well-being. Educational programs should encourage active involvement. This entails teachers employing interactive teaching methods to engage students.

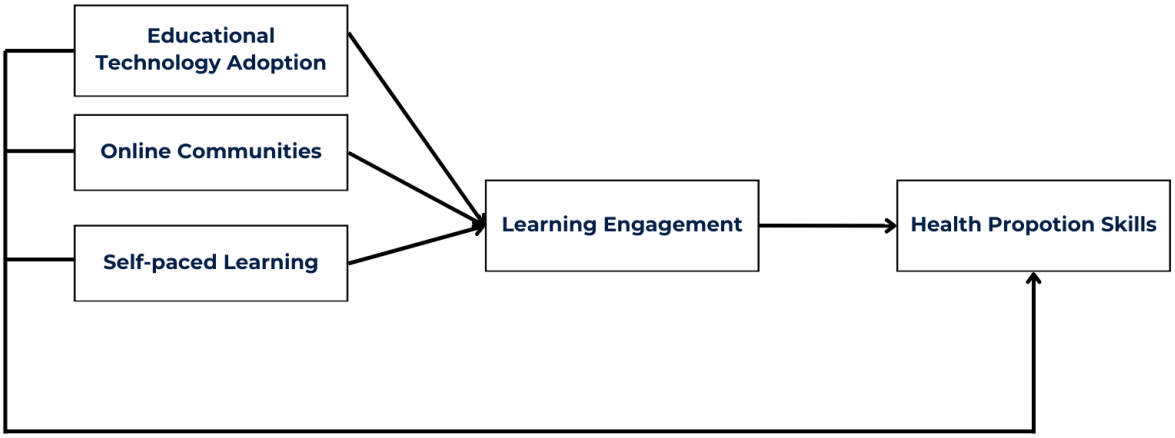
Educational technology is always developing, so keeping up with new ideas is crucial. Due to rapid technological innovation, new tools and platforms must be constantly adapted and integrated. Innovative technologies should be discovered and used by institutions and educators to improve health education. The report also acknowledges virtual communities' worldwide reach and intercultural teaching potential. Academic institutions may establish foreign cooperation to broaden students' perspectives on global health promotion. Educational technologies, online communities, and self-directed learning are highlighted in the debate, which stresses access equality. A digital divide may come from students' unequal access to technology and online resources. Schools should ensure that all students, regardless of their circumstances, have equitable access to educational resources and skill development. The comprehensive study of the complex relationships between educational technology, online communities, self-paced learning, learning engagement, and health promotion skills in graduate physical education programs yields many important propositions (see Table 8). These statements seek to inform health education research, instruction, and policy.

Table 8
*Proposition Developed on the basis on the Findings of the Study*

| *Proposition* | *Description* |
|---|---|
| 1. | Educational technology adoption positively influences students' health promotion skills. |
| 2. | Active engagement in online communities fosters a supportive environment that motivates students to adopt healthier habits. |
| 3. | Self-paced learning empowers students to take control of their health education. |
| 4. | Learning engagement serves as a mediator, catalyzing the positive relationship between educational technology adoption, online community engagement, self-paced learning, and the development of students' health promotion skills. |

Based on the above discussion, the study established a thorough framework for controlling graduate physical education teaching methods. The paradigm encourages a holistic approach to educational technology use, acknowledging its benefits for health promotion skills and addressing concerns about excessive screen time. Four basic assumptions underpin it. The framework fosters online community friendliness and digital knowledge to help members overcome problems. Self-directed learning, self-sufficiency, and time management are promoted by the framework. The approach acknowledges that learning engagement helps students make good linkages between educational variables and health promotion. It also offers practical advice for academic success and well-being. Figure 1 represents the potential framework derived from the qualitative findings.

Figure 1
*Conceptual Framework*




## 6. Conclusion

This study explores the complicated relationships between graduate physical education courses' learning engagement, online community engagement, and educational technology adoption. Qualitative investigation reveals the numerous linkages that impact students' health promotion. Educational technologies and online communities enhance self-directed learning, according to the findings. Online settings demand screen time management and digital literacy. The vital function of learning engagement as a mediator emphasizes the importance of a healthy link between educational attributes and well-being. These findings provide a comprehensive framework that connects theory and practice and provides educators and policymakers with practical advice to promote students' overall well-being and academic achievement. The links between technology, community, autonomy, and engagement show that health education is changing. This study adds depth to the debate over successful educational methods by examining the links. The approach inspires stakeholders to consider the entire development of graduate students in physical education programs by making interventions practical. Results of study will inspire more research and conversation to promote a complete education system that protects students' well-being and promotes academic ability.

## 7. Theoretical and Practical Implications

The research highlights how environmental, behavioral, and psychological factors interact and change. Modern theories like Social Cognitive Theory support this. The findings illustrate how learning engagement, self-paced learning, educational technology adoption, and online community engagement affect students' health promotion abilities. Social Cognitive Theory states that learning is impacted by one's environment, past experiences, and capacity to observe and mimic others. This study also supports Self-Determination Theory, which may help us comprehend educational motivation and self-governance. Self-determination theory allows students to study at their own speed, which promotes competence and autonomy in health education. According to the paradigm, competent and autonomous people are more self-motivated. Based on these ideas, our research shows that students' capacity to make their own judgments during learning affects their health promotion abilities. The focus on learning engagement as a mediator in this study is consistent with current hypotheses that link students' health-related activities to academic achievement. Engagement theories say students learn better when they are emotionally involved in and actively participate in their education. This study uses learning engagement as a mediator to underline the importance of health promotion skills and educational qualities and their beneficial associations. This research emphasizes the role of involvement in improving health and academic performance to enhance engagement theories.

Considering how cultural and institutional elements affect the relationships under consideration provides a complete picture. According to ecological models of health behavior, cultural, institutional, and social aspects must be considered. Graduate physical education programs can better comprehend socioecological elements affecting health education by acknowledging the possible influence of cultural backgrounds and institutional structures on health promotion abilities and instructional components.

This study has practical implications for physical education practitioners. The framework's findings have practical implications for graduate curriculum, education, and health promotion. Academics may employ instructional technology to increase health literacy and well-being. Universities should consider building health education-specific online communities where students may exchange information and experiences. Self-paced learning emphasizes giving students agency while providing time management guidance. Adaptable learning modules and materials allow students to acquire health education at their own pace. The research's focus on learning engagement as an intermediary show that active participation is essential for linking academic experiences and health promotion skills. By using interactive and collaborative learning methods, educators say, students may apply their knowledge in practical circumstances. This method is in keeping with the current trend toward experiential learning, which includes students not just studying but also applying it in practical settings. Therefore, incorporating health promotion into the curriculum ensures that students' academic experiences are closely linked to the development of practical skills and habits that improve their general well-being. The findings suggest policymakers should integrate health education in institutions' student improvement goals. Health education programs can benefit from self-directed learning, user-friendly online platforms, and balanced technology utilization. Policymakers may collaborate with health experts and educators to develop quantifiable criteria that employ technology to enhance education and safeguard students. The research emphasizes cultural and institutional factors, recommending personalized methods. Educational institutions with diverse student populations should adapt health education to cultural and learning styles. Easy options include language changes, culturally appropriate instructional materials, and student-specific learning paths. Practical suggestions for schools improving health education in various academic situations is provided in the study.

## 8. Limitations and Future Directions

The findings of this study are valuable, yet it has limitations. First, the qualitative investigation improves the data' completeness and depth but limits their applicability. The study's restricted emphasis on graduate students in physical education programs should be considered when extending these findings to other academic subjects or degrees. Though sufficient for a qualitative study, the sample size may restrict the findings' application. Future research should involve more academic disciplines and institutions to boost external validity. Self-report bias is another qualitative research concern. Participants may have been encouraged to give socially desired answers, which may have affected their testimony. Despite trying to build a good relationship and create an open environment during the interview, it is necessary to conduct more research to explore other methods, such as combining approaches or observing over a longer period of time, to improve results reliability. The research was limited to graduate students, making it difficult to apply to undergraduates. Graduate students may have different views on educational technology, online communities, and self-paced learning than undergraduates due to their academic and personal experiences. To further understand the dynamics, additional research is needed on these features across student populations. The study also primarily relied on participant self-reports to assess their health promotion engagement and abilities. Objective metrics or external observations can help one understand this research's links better. This methodological adjustment would reinforce the study's claims and help us understand how educational factors impact students' health.

Despite these limitations, this study proposes future investigation. Future research may examine how educational technologies, online communities, and self-paced learning affect students' health promotion skills. Progressive behavior and attitude changes should be included in this research. Researchers and higher education decision-makers who want to promote technology and community participation may want to study how institutional backing and resources affect students' experiences with these educational features. A interesting research area is how cultural and contextual factors affect students' attitudes and usage of educational technology, online communities, and self-paced learning. A full knowledge of how cultural diversity interacts with technology and learning approaches is needed since cultural differences may affect their efficiency in different educational environments.

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**Declaration of interest:** The authors declared that there were no potential conflicts of interest.

**Data availability:** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

**Ethical statement:** All participants provided informed consent prior to their involvement in the study. They were informed about the purpose od the study, procedures, and their right to withdraw at any time without any consequences.

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