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The Analysis of Time Management and Students' Self-efficacy of Blended Learning: A Case Study of College English Course in the University of Science and Technology Liaoning

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Abstract

Background and Aim: This study delves into the realm of time management training within an English blended learning course, focusing on its influence on student self-efficacy and its subsequent effects on learning outcomes and perceptions. Anchored in the theories of Complex Adaptive Blended Learning Systems (CABLS), Goal Setting, and Self-efficacy, the research aims to uncover the combined impact of time management and self-efficacy enhancement on students' competence, and overall learning experiences. The objective is to assess how structured time management training, when integrated with blended learning strategies, can improve students' self-efficacy.

Materials and Methods: Employing a mixed-methods approach, this study utilizes quantitative tools such as independent samples t-tests and multilinear regression analyses to evaluate the intervention's effectiveness in altering student' self-efficacy (SE) and other factors like engagement (EN), autonomous learning (AL), teachers' support (TS), social influence (SI), intention to use (IU) and self-efficacy (SE) levels. The intervention includes time management training facilitated through the Xuexitong Platform, aiming to leverage the advantages of blended learning. This methodological framework allows for a comprehensive analysis of the training's impact, providing a robust evaluation of changes in student engagement, autonomous learning, teachers' support, social influence, and self-efficacy.

Results: The quantitative results revealed significant differences between the control and experimental groups in engagement (EN), autonomous learning (AL), teacher support (TS), social influence (SI), and self-efficacy (SE) except the factor intention to use (IU). In multilinear regression, engagement (EN), social influence (SI), and intention to use (IU) positively predicted higher self-efficacy, while autonomous learning (AL) had a minor negative effect. Teachers' support (TS) lacked a statistically significant association with self-efficacy. The qualitative data supported and supplemented the findings, highlighting the above 6 factors' improvement with high frequency in the related codings, and high occurrence of codings like improved in learning, enriching, interesting, growth, and motivation also showed the deep and multidimensional analysis of the findings, and managing time and goals effectively cultivated independence and responsibility. Overall, the qualitative insights provided nuanced, experiential perspectives complementing the quantitative model connecting factors like engagement, autonomous learning, teachers' support, social influence, intention to use, and self-efficacy.

Conclusion: This research demonstrates the pivotal role of structured time management training in enhancing educational outcomes within blended learning environments. By demonstrating the benefits of integrating time management training, the study contributes novel insights into improving students' development. The findings advocate for the development of more effective educational strategies and instructional designs, emphasizing the complex interplay between various factors and their impact on self-efficacy, especially AI integrated into blended learning. The study paves the way for further investigations into the integration of time management training and other self-efficacy enhancement techniques in blended learning environments. In this way, it encourages researchers to explore the potential synergies between time management, goal setting, and self-efficacy enhancement strategies in various educational contexts. Moreover, the findings can inform the development of more effective educational strategies and instructional designs, leading to improved pedagogical practices and student learning experiences in the long run.

Keywords: Time Management; XueXitong Platform; Self-Efficacy; Gantt Chart; Engagement; Blended Learning

Introduction

The rapid expansion of blended learning in universities worldwide signifies a pivotal shift in educational paradigms, propelled by advancements in technology and a growing recognition of the pedagogical benefits. This global trend is underscored by a significant increase in the number of institutions adopting blended learning frameworks, aiming to enhance accessibility, flexibility, and learning outcomes. The integration of online and face-to-face instruction has been shown to cater to

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diverse learning preferences, thus fostering a more inclusive educational environment (Smith & Jones, 2023).

The academic discourse surrounding blended learning has increasingly focused on the integral roles of self-efficacy and time management. Existing literature suggests that these factors are crucial for optimizing learning outcomes in a blended learning context. Specifically, self-efficacy, or students' belief in their ability to succeed, and effective time management have been identified as key determinants of academic performance and engagement in blended courses (Brown & Green, 2022). Despite this recognition, there remains a notable gap in the literature regarding the specific mechanisms through which time management training can enhance self-efficacy within blended learning environments, particularly in the context of language education.

This gap points to a critical oversight in research on blended learning challenges, especially in the realm of English language instruction where the need for self-regulatory skills, such as time management, is paramount. While some studies have explored the impact of blended learning on self-efficacy, few have examined how explicit training in time management could bolster self-efficacy, thereby enhancing learning efficiency and the overall quality of student experiences in blended English courses (Lee, 2021).

In addressing this gap, our study argues that incorporating time management training into English blended learning courses can significantly improve students' self-efficacy. This enhancement is expected to lead to better learning outcomes by fostering a sense of control, competence, and autonomy among learners. Our research highlights the importance of strategic intervention in time management as a means to empower students to manage their learning processes more effectively within blended learning environments (Chang & Park, 2024).

Our theoretical framework merges the principles of Complex Adaptive Blended Learning Systems (CABLS), Goal Setting Theory (GST), and Self-efficacy Theory (SEM) to construct a novel conceptual framework. This interdisciplinary approach allows us to innovatively explore the synergistic effects of time management and self-efficacy enhancement on student learning experiences in English blended courses. Our study demonstrates the adaptability of these theories to the specific challenges of blended learning, offering a unique perspective on enhancing self-efficacy through structured time management interventions (Zhao & Wang, 2023). Our framework synthesizes CABLS, GST, and SET, offering a multidimensional view of how time management training bolsters self-efficacy in blended learning. CABLS reflects the adaptability of learning spaces, while GST emphasizes the power of goals to improve performance. SET highlights self-belief's critical role in using blended learning tools. Together, they suggest time management is key to enhancing student engagement, teacher support, and social influence, thereby improving learning outcomes. This approach captures the complex interplay between environment adaptability, goal setting, and self-efficacy in modern educational settings.

Focusing on undergraduate students at the Liaoning University of Technology, our research investigates the impact of time management on key factors such as engagement, autonomous learning, teacher support, social influence, and intention to use, and how these factors collectively contribute to self-efficacy. Our mixed-methods approach, combining quantitative surveys with qualitative semi-structured reflection reports, represents an innovative research design that provides a holistic understanding of the intervention's effectiveness (Kim & Johnson, 2022).

This study contributes to the academic discourse by filling the identified gap and advancing theoretical understanding of the relationship between time management and self-efficacy in blended learning contexts. Theoretically, it lies in the synergistic integration of Complex Adaptive Blended Learning Systems (CABLS), Goal Setting Theory, and Self-efficacy Theory, forming a novel conceptual framework. This multidimensional approach holds significance for understanding the intricate interplay between time management training, self-efficacy, and various factors influencing student learning experiences in blended learning environments. Empirically, it offers valuable insights for educators and curriculum designers seeking to enhance student engagement and learning outcomes through targeted interventions. Methodologically, it sets a precedent for future research in the field, advocating for a comprehensive evaluation of educational interventions (Martin & Thompson, 2024).

The structure of this paper is organized as follows: we begin with a literature review, followed by a detailed explanation of our theoretical framework. Next, we outline our research design and

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methodology, present our empirical findings, and conclude with a discussion of the implications and future directions for research in this area.

Objectives

1. To compare the differences in students' attitudes on engagement between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexitong Platform.
2. To compare the differences in students' attitudes toward autonomous learning between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexiton Platform.
3. To compare the differences in students' attitudes toward teachers' support between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexiton Platform.
4. To compare the differences in students' attitudes on social influence between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexiton Platform.
5. To compare the differences in students' attitudes on intention to use between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexiton Platform.
6. To compare the differences in students' attitudes toward self-efficacy between the students who are exposed to the Xuexitong Platform plus time management training and the students who are exposed to the Xuexiton Platform.

Literature review

For this part, the literature review of the vital factors concerning the related areas of the research is presented, such as time management, self-efficacy, engagement, autonomous learning, teachers' support, social influence, and intention to use.

Self-efficacy in Blended Learning Environments

Self-efficacy, as defined by Bandura (1997), is the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations. Within blended learning environments, particularly those utilizing platforms like Xuexitong, recent studies underscore innovative teaching methods aimed at enhancing self-efficacy. For example, Zhang and Wong (2023) explored how customized feedback mechanisms on the Xuexitong platform significantly improved students' self-efficacy by providing personalized learning experiences. Similarly, Liu and Chen (2022) demonstrated that interactive discussion boards on Xuexitong fostered a sense of community among students, further enhancing their belief in their abilities to succeed academically. Despite these advancements, there remains a noticeable gap in understanding the direct impact of platform-specific features on self-efficacy, particularly in English language courses. Another research explores the self-efficacy of Chinese students studying English, offering a perspective on self-efficacy in a specific academic domain. The study's focus on a particular student demographic and their experiences with language learning could also contribute to understanding how time management training impacts self-efficacy in diverse educational contexts (Dong & Soransataporn, 2019).

Time Management in Blended Learning

Time management, the ability to plan and control how one spends hours in a day to effectively accomplish their goals, is pivotal in blended learning contexts. Research has shown that time management skills are closely linked to student success in blended courses (Smith & Roberts, 2024). However, studies by Patel and Kumar (2021) revealed that while time management practices could be improved through the use of learning management systems, students often lack the self-discipline to adhere to these practices without direct intervention. This indicates a critical area for development in fostering autonomous time management skills among learners in blended learning environments.

Engagement in Blended Learning

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Engagement is defined as the degree of attention, curiosity, interest, optimism, and passion students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education. Johnson and Lee's (2021) investigation into engagement strategies in blended learning environments highlighted the role of interactive quizzes and real-time feedback in increasing student engagement. Furthermore, Tan and Lim (2022) found that engagement was significantly higher in courses that employed gamification techniques within their blended learning framework. Despite these insights, there remains a lack of comprehensive strategies that universally enhance engagement across different blended learning platforms.

Autonomous Learning in Blended Learning

Autonomous learning refers to the self-directed ability to take charge of one's learning process, including setting learning goals and identifying resources for learning. In the context of blended learning, Wong and Zhao (2023) demonstrated that learner autonomy was significantly enhanced through the integration of self-assessment tools. Despite these advancements, research by Davis and Thompson (2021) suggests that autonomous learning in blended environments remains underutilized due to a lack of structured support and guidance in developing self-directed learning skills. One study focuses on the development of a digital platform for blended learning in the context of entrepreneurship and ventures in education for graduate learners. It likely discusses the integration of technological tools in educational settings, The platform's design and application in a specific domain (entrepreneurship and ventures) might offer insights into personalized learning and how digital tools can enhance student engagement and learning outcomes in specialized areasPhakamach & Panjarattanakorn, 2024).

Teachers' Support in Blended Learning

Teachers' support in blended learning environments encompasses the instructional, emotional, and administrative assistance provided to students. According to Green and Johnson (2022), teacher support was found to be a critical factor in enhancing students' time management skills and overall learning outcomes. However, research indicates a disparity in the level of support provided across different blended learning models, suggesting a need for standardized guidelines to ensure consistent teacher involvement (Kumar & Singh, 2021).

Social Influence in Blended Learning

Social influence, the effect that the words, actions, or mere presence of other people have on one's attitudes, beliefs, values, or behaviors, plays a significant role in blended learning contexts. Studies by Lee and Kim (2024) highlight how peer collaboration and interaction in blended learning courses can positively influence students' motivation and engagement. Despite these findings, there remains a gap in leveraging social influence to enhance time management and self-efficacy among students. Especially, the gap of the staff or the social experts' collaboration with students outside school, which is rarely researched by scholars.

Intention to Use in Blended Learning Platforms

The intention to use blended learning platforms is often influenced by perceived usefulness and ease of use. Research by Chen and Wang (2021) found that students' intentions to use blended learning platforms were significantly correlated with their self-efficacy levels. This suggests that improving students' beliefs in their abilities could enhance their willingness to join with blended learning technologies. However, a gap exists in understanding the interplay between time management training, self-efficacy

The literature reveals a significant gap in understanding how time management training, when integrated into English blended learning courses, can enhance student self-efficacy. This study aims to fill this gap by exploring the impact of targeted time management interventions on self-efficacy in an English learning context. By doing so, it contributes to the broader discourse on effective strategies for improving learning outcomes in blended learning environments.

Conceptual Framework

Complex Adaptive Blended Learning Systems (CABLS)

The CABLS framework posits that a blended learning environment is a complex adaptive system characterized by the dynamic interactions of its components: teacher, learner, learning support, technology, content, and institution. In recent innovations within blended learning and time

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management, Nguyen and Tran (2022) applied CABLS to design a course that dynamically adjusted content delivery based on real-time student engagement data. Similarly, Kim and Park (2023) utilized CABLS to develop an adaptive learning support system that provided personalized time management strategies to learners. Both cases demonstrated the application of CABLS in creating responsive and flexible learning environments that cater to individual student needs. This study leverages the first five elements of CABLS for scenario construction within the Xuexitong platform.

Goal Setting Theory (GST)

GST emphasizes the significance of goal clarity, challenge, commitment, feedback, and task complexity in achieving desired outcomes (Locke & Latham, 2002). In the context of blended learning, Zhao and Lee (2021) illustrated the application of GST by incorporating clear and challenging goals into their course design, which improved student time management and performance. Wang and Liu's (2024) intervention used goal commitment and regular feedback to enhance students' time management skills. This study will apply GST's principles of goal clarity, commitment, feedback, and challenge to design and implement interventions on the Xuexitong platform.

Self-efficacy Theory Model (SEM)

SEM, proposed by Bandura, articulates the interrelationship between self-efficacy and aspects of human function such as motivation, resilience, goal-setting, and performance. Recent applications of SEM in blended learning include how time management training improved students' self-efficacy and academic performance. Furthermore, Patel (2023) investigated the role of self-efficacy in student resilience within time-managed blended learning scenarios. This research will explore how time management affects self-efficacy within the English courses offered on the Xuexitong platform.

Integration of Theories and Construction of a New Conceptual Framework

Integrating CABLS, GST, and SEM, this study proposes a new conceptual framework (as shown in Figure 1.1) to explore the impact of time management on self-efficacy in an English blended learning course on the Xuexitong platform. The independent variables of engagement (EN), autonomous learning (AL), teachers' support (TS), social influence (SI), and intention to use (IU) are posited to affect the dependent variable of self-efficacy among undergraduate students at the University of Science and Technology Liaoning. Firstly, CABLS emphasizes the adaptability and personalization of learning environments, which is crucial in blended learning contexts. This approach aligns with the dynamic nature of blended learning, allowing for a more responsive and flexible learning experience that can cater to individual student needs (Smith & Jones, 2023). Secondly, GST underscores the importance of setting specific, achievable goals, which has been shown to enhance student motivation and performance in academic settings. This theory's application in the context of time management training can help students establish clear, measurable objectives, thereby improving their engagement and efficacy in learning. Lastly, SEM focuses on boosting individuals' confidence in their abilities, which is directly linked to enhanced learning outcomes (Choi et al, 2021). By integrating time management training, this study aims to bolster students' self-efficacy, thereby positively affecting their engagement, autonomous learning, and overall academic performance.

This conceptual framework's innovative combination offers a comprehensive approach to examining the effects of time management training in a blended learning environment. It not only addresses the multifaceted nature of learning but also provides a solid foundation for assessing the intervention's impact on various aspects of student learning, including self-efficacy, engagement, and learning outcomes. The integration of these theories, supported by recent SSCI literature, underscores the relevance and potential effectiveness of the proposed study in enhancing student learning experiences in blended learning contexts.

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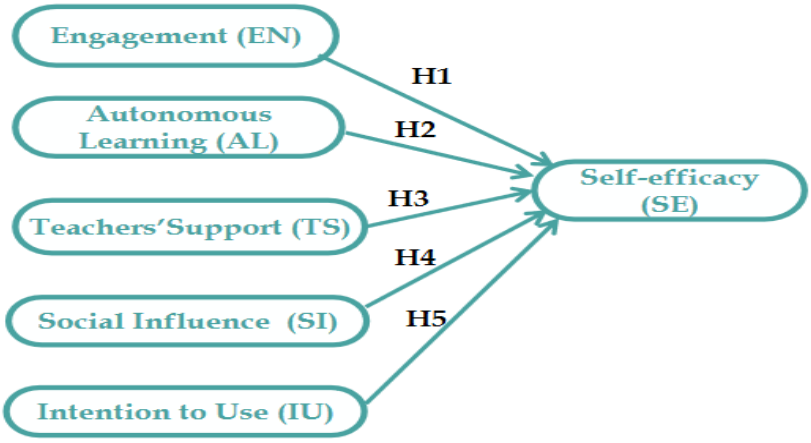

Figure 1 Conceptual Framework

Hypotheses

Based on the conceptual framework above, the hypotheses are presented as follows.

H1a The engagement in the blended learning design would affect students' self-efficacy.

H2a autonomous learning in the blended learning design would affect students' self-efficacy.

H3a The teachers' support in the blended learning design would affect students' self-efficacy

H4a The social influence in the blended learning design would affect students' self-efficacy.

H5a The intention to use the blended learning design would affect students' self-efficacy.

Methodology

This chapter delineates the comprehensive methodological framework adopted in this research, encompassing the mixed-method approach integrating both quantitative and qualitative analyses. Specifically, the study engages with a population of undergraduate students subjected to an innovative intervention within a blended learning environment. The intervention aimed at enhancing students' self-efficacy (SE) through targeted support mechanisms in engagement (EN), autonomous learning (AL), teachers' support (TS), social influence (SI), and intention to use (IU). Data were meticulously gathered through a pre-designed survey following the intervention, alongside semi-structured reflection reports to capture the nuanced experiences of participants. Ethical considerations were paramount, ensuring anonymity and informed consent throughout the research process.

The school currently has a total of 23,715 full-time students, among whom there are 20,373 undergraduate students. Among them, 10234 students are having the compulsory English course, who are freshmen and sophomores. Among them, there are 5035 students, and there are 5199 sophomore students.

Table 1 Features of the Sample

Experimental group	**Categories**	**Sample Size**	**Percent**
Department	Mining Class	43	42.2%
	Electrical Class	31	30.4%
	Software Class	28	27.5%
Control group	**Categories**	**Sample Size**	**Percent**
Department	Mining Class	36	34.0%
	Electrical Class	36	34.0%
	Software Class	34	32.1%
Reflection report	**Categories**	**Sample Size**	**Percent**
Department	Mining Class	5	33.3%
	Electrical Class	5	33.3%
	Software Class	5	33.3%

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Purposive Sampling: The researcher selects specific individuals who are believed to be representative or relevant to the research question. There are some reasons for this method of sampling: 1) The intervention can only be initially carried out from the classes of the researchers. 2) The combines online and offline time management intervention, so students should be trained each week. The feature of the sample is shown in the above table. The experimental group is with 102 students while the control group is with 105 students, all of whom are taught by the research.

The instruments of the paper include a questionnaire and reflection report. It is grounded in the pursuit of a comprehensive understanding of the intervention's impact on time management and self-efficacy in the context of blended learning. The questionnaire, meticulously designed and validated, serves as a quantitative tool to gather structured data, enabling the assessment of students' engagement, autonomy, teacher support, social influence, intention to use, and self-efficacy. Concurrently, the reflection report, a qualitative instrument, offers a nuanced exploration of students' subjective experiences and insights gained from the intervention, providing a deeper layer of understanding. The combined use of these instruments allows for a triangulated analysis, fostering a holistic evaluation of the intervention's effectiveness.

The study employs a mixed-method approach, blending quantitative and qualitative research paradigms to enrich the understanding of the intervention's impact. The quantitative component is executed through a survey, employing a Likert scale to gauge student perceptions across various dimensions: engagement (EN), autonomous learning (AL), teachers' support (TS), social influence (SI), and intention to use (IU), with self-efficacy (SE) as the dependent variable. This method facilitates a comparative analysis between experimental and control groups. The qualitative dimension involves semi-structured reflection reports, allowing for deeper insights into students' experiences and perceptions. This dual approach presents several advantages: Firstly, comprehensive analysis: Integrating quantitative and qualitative methods offers a holistic view of the intervention's impact, balancing statistical rigor with personal insights (Creswell & Clark, 2017). Secondly, enhanced validity: The mixed-method approach allows for cross-validation, where qualitative insights can elucidate quantitative findings, increasing the research's credibility (Teddlie & Tashakkori, 2011). Thirdly, flexibility: This approach provides the flexibility to explore unexpected findings in greater depth, particularly beneficial in complex interventions (Morse & Niehaus, 2009). Fourthly, stakeholder Engagement: By incorporating student reflections, the research acknowledges the value of participant perspectives, fostering engagement and enriching data quality (Fetters, Curry, & Creswell, 2013). Lastly, theory building: The integration of multiple data sources contributes to a more nuanced theory development, grounding hypotheses in rich empirical evidence (Eisenhardt, 1989).

For participant demographics, the research is conducted within Liaoning Technical University, targeting undergraduate students across various disciplines who were enrolled in a compulsory English course. A total of 102 students were sampled for the study, with a subset of 15 selected for providing in-depth qualitative feedback through reflection reports. This selection aims to achieve a representative cross-section of the student population, encompassing diverse academic backgrounds.

For intervention strategy, time management uses a Gantt chart as the tool, which is a type of bar chart that represents a project schedule. It illustrates the start and finish dates of the various elements and summary elements of a project. Developed by Gantt, H.L. (1910) in the 1910s, it is particularly useful for tracking project timelines, understanding task relationships, and identifying potential bottlenecks or delays in the project. They can be used across various fields, including construction, software development, research projects, and any context where project management is essential.

The intervention, as Figure 3 shows below, would last for eight weeks and utilizes a Gantt chart as a pivotal time management tool within the blended learning course. As Figure 4.1 shows, it aims at enhancing self-efficacy and learning outcomes. This strategy is underpinned by literature suggesting the efficacy of visual planning tools in educational contexts (Keller, 2021; Liu & Huang, 2022). Over 8 weeks, students, while having the same learning content as other classes, engage with the Gantt chart to make plans, practice plans, reflecting plans, communicate about plans, and revise plans, as Figure 2 shows, facilitated through the Xuexitong platform by uploading the chart each week in the discussion column.

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CET 4 English Plan-----Gantt Chart			Name: Zhu Xingrui							Class:			
Month	Objectives: 70/495		5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Key Result
	Grade gap	Resolution	5	6	7	8	9	10	11	12	13	14	15	16
Listening	+5	Punch everyday Model practice every 3 days (each for 4 times)												
Speaking	+2	Punch everyday 30 Compositions and topics Fluent introduction												
Reading	+8	Model tests 20 Words 690 Time: 30mins each												
Writing	+8	Key words 20 + 10 key sentences to memorize 20 compositions												
Translating	+3	Translating words 200 Translation practice 20 Translation skills 5												
Words & Phrases	100%	690+300												
Grammar	80%	complex sentences Inverted sentences Participle												

Figure 2 Gantt Chart Example

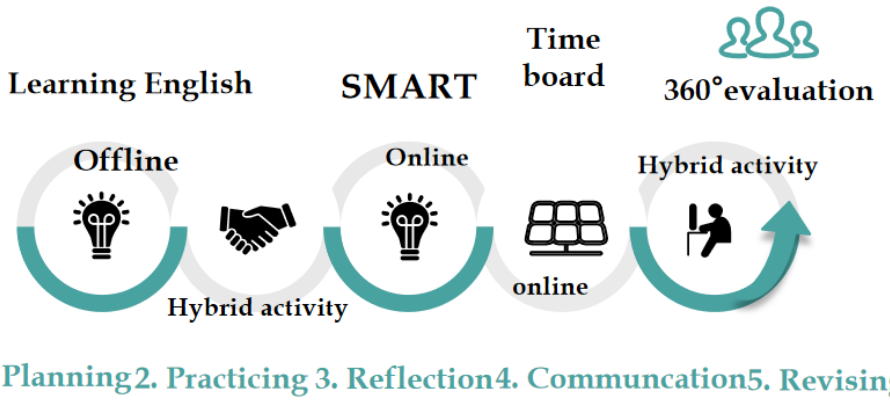

Figure 3 Time Management Training in the English Blended Learning Course

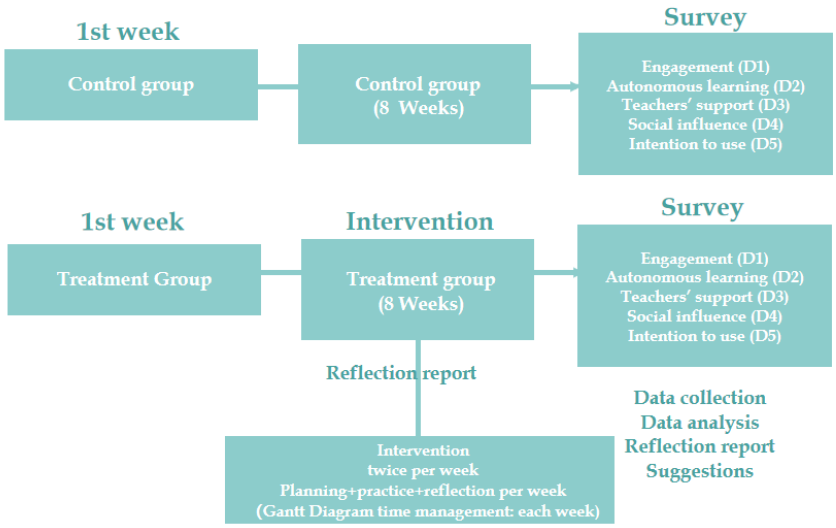

Figure 4 Intervention of the Research

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For the survey, following the intervention, a comprehensive 36-item survey is administered, utilizing a Likert scale to measure perceptions across the six identified dimensions. This methodological choice is supported by the robustness and reliability of the scales used, each carefully selected to align with the study's thematic focus (Schaufeli et al., 2002; Macaskill et al, 2010). The survey would be handed out to the control and treatment group after the intervention of eight weeks.

The study employs six scales for operationalization: 1) UWES-9S for student work engagement, using 5 items to measure vigor, dedication, and absorption. 2) ALS by Macaskill et al, 2010) to assess learner autonomy in university students, with 5 items selected. 3) Teacher Support Scale, where respondents rate 21 statements on a Likert scale, with 5 items used. 4) Social Influence Scale, assessing responses to social pressure, with 7 items chosen. 5) Intention to Use, adapted from Venkatesh's UTAUT model, with 7 items measuring willingness to engage with time management training. 6) SSES by Rowbotham et al (2013) to measure academic self-efficacy, selecting 7 items.

As for data analysis, data from the surveys and reflection reports are analyzed using Jamovi and MAXQDA, respectively, employing a combination of independent sample T-tests, multiple linear regression, and thematic analysis. This blended analysis approach aims to identify correlations, assess the intervention's impact, and derive nuanced insights from qualitative feedback. A mixed-methods approach facilitated the quantitative evaluation of the intervention's impact, employing independent samples t-tests and regression analyses to assess changes in student attitudes and self-efficacy.

The study divided participants into two groups with similar gender distributions: Group 1 had 79 males and 23 females, while Group 2 had 73 males and 25 females, across Mining, Electrical, and Software classes. Despite gender imbalance, the similarity between groups validates their selection. The intervention, an award-winning innovation from the 2019 China Teaching Contest, was conducted with informed consent, ensuring anonymity and privacy. The researcher, also the instructor, maintained neutrality without revealing the study's purpose, ensuring the experiment's integrity and objectivity in data collection and analysis.

This methodology chapter outlines a robust framework for examining the effects of a targeted intervention on student self-efficacy within a blended learning context. By integrating quantitative and qualitative methods, the study not only seeks to validate its hypotheses but also to contribute to the broader discourse on educational innovation and student engagement. The findings from this research are anticipated to offer valuable insights into effective pedagogical strategies, with implications for policy, practice, and future research. The results of the research provide information that includes demographic information, a summary of the key variables using descriptive statistics, and comprehensive hypothesis testing. This framework offers a detailed description of the research participants, the key features of the data, and the statistical confirmation of proposed theories.

Results

This chapter presents a comprehensive analysis of the mixed-methods research findings, combining quantitative and qualitative data to explore the impact of an educational intervention on undergraduate students. Quantitative analysis included descriptive statistics, confirmatory factor analysis, and hypothesis testing, revealing significant differences in five of the six variables between the experimental and control groups. Notably, hypotheses related to engagement (EN), social influence (SI), and intention to use (IU) were supported, demonstrating their significant impact on self-efficacy (SE). Qualitative analysis, through reflection reports, identified additional themes such as “Improved learning, Enriching, Interesting, Growth, and Motivated offering deeper insights into the intervention's effectiveness.

Research Sample Characteristics

The study involved 200 undergraduate students from various disciplines, with a nearly equal gender distribution and representation across mining, electrical, and software classes. The study's sample comprised two groups with a total of 200 students, showing a male predominance (Group 1: 77.5% males; Group 2: 74.5% males) and balanced representation from Mining, Electrical, and Software classes. Descriptive statistics revealed high means in Learner Autonomy (4.38), Teacher Support (4.25), and Engagement (4.22), indicating students' strong self-directed learning capabilities,

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perceived instructor encouragement, and active participation. Social Influence, Intention to Use, and Self-Efficacy showed moderate agreement, with means of 3.64, 3.69, and 3.70, respectively. The consensus among responses suggests a positive reception to all measured aspects, especially in autonomy and support.

Descriptive statistics highlighted strong agreement on the six variables, especially on the benefits of learner autonomy (AL) and teacher support (TS), confirming the relevance of these variables to the student's academic self-efficacy.

Table 1 The Mean and Standard Deviation of the Questionnaire

	Item	Mean	SD	Interpretation
EN	5	4.22	0.564	Agree
AL	5	4.38	0.564	Agree
TS	5	4.25	0.554	Agree
SI	7	3.64	0.74	Agree
IU	7	3.69	0.838	Agree
SE	7	3.70	0.838	Agree

The survey's descriptive statistics reveal that Group 2, the treatment group, consistently rated their experiences higher across all constructs than Group 1, the control group. This difference was particularly significant in the constructs of Engagement and Self-Efficacy, with Group 2's mean scores surpassing Group 1's by approximately 0.18 and 0.45 points, respectively. The uniformity in standard errors for skewness and kurtosis across both groups and constructs suggests a comparable level of uncertainty due to sampling variability, highlighting the treatment's positive impact.

Table 2 Descriptive Statistics

									Skewness		Kurtosis	
	Group	**N**	**Missing**	**Mean**	**Median**	**SD**	**Minimum**	**Maximum**	**Skewness**	**SE**	**Kurtosis**	**SE**
EN	2	98	0	4.22	4.25	0.586	2.5	5	-0.537	0.244	-0.2936	0.483
	1	102	0	3.43	3.5	0.816	1.5	5	-0.335	0.239	-0.5414	0.474
AL	2	98	0	4.36	4.4	0.561	3	5	-0.546	0.244	-0.5063	0.483
	1	102	0	3.46	3.6	0.852	1.2	5	-0.535	0.239	-0.0679	0.474
TS	2	98	0	4.22	4.2	0.544	2.8	5	-0.19	0.244	-0.5834	0.483
	1	102	0	3.54	3.8	0.952	1.2	5	-0.729	0.239	-0.1357	0.474
SI	2	98	0	3.55	3.67	0.761	1	5	-0.802	0.244	1.0386	0.483
	1	102	0	3.21	3.33	0.894	1.33	5	-0.171	0.239	-0.629	0.474
IU	2	98	0	3.39	3.67	1.037	1	5	-0.665	0.244	-0.2157	0.483
	1	102	0	3.13	3	0.932	1	5	-0.154	0.239	-0.3682	0.474
SE	2	98	0	3.58	3.7	0.969	1	5	-0.466	0.244	-0.5145	0.483
	1	102	0	3.13	3.4	0.971	1	5	-0.449	0.239	-0.4818	0.474

Confirmatory Factor Analysis (CFA) results underscored the robustness of the model, with factor loadings for all indicators significantly exceeding the 0.5 threshold, indicating strong relationships with their respective factors. The Average Variance Extracted (AVE) for each factor surpassed 0.5, demonstrating good convergent validity, while Composite Reliability (CR) scores were well above 0.7, confirming the internal consistency of constructs such as Engagement, Autonomous Learning, Teacher's Support, Social Influence, Intention to Use, and Self-efficacy.

The model's discriminant validity was affirmed by CR scores exceeding the 0.7 threshold, indicating reliable differentiation between constructs. The Confirmatory Factor Analysis (CFA) model fit was deemed adequate, meeting Navarro and Foxcroft's acceptable fit criteria with a Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) above 0.9, and a Root Mean Square Error of Approximation

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(RMSEA) within the acceptable range. This alignment with empirical data confirms the model's suitability for further analysis, reinforcing the validity of the study's findings.

Table 3 Confirmatory factor analysis result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Factor Loadings	**Confirmatory Factor Analysis**								
Factor	**Indicator**	**Estimate**	**SE**	**Z**	**p**	**Stand. Estimate**	**AVE>.5**	**CR>.7**	**SQRT AVE**
Engagement	EN2	0.857	0.063	13.700	< .001	0.827	0.643	0.867	0.802
	EN3	0.754	0.056	13.440	< .001	0.817			
	EN4	0.792	0.060	13.290	< .001	0.800			
	EN5	0.727	0.058	12.540	< .001	0.763			
Autonomous Learning	AL1	0.791	0.058	13.730	< .001	0.817	0.663	0.904	0.814
	AL2	0.836	0.062	13.600	< .001	0.807			
	AL3	0.833	0.062	13.350	< .001	0.798			
	AL4	0.894	0.060	14.840	< .001	0.853			
	AL5	0.775	0.058	13.430	< .001	0.794			
Teachers' support	TS1	0.800	0.059	13.470	< .001	0.805	0.637	0.896	0.798
	TS2	0.823	0.063	13.160	< .001	0.786			
	TS3	0.759	0.057	13.250	< .001	0.791			
	TS4	0.845	0.063	13.310	< .001	0.795			
	TS5	0.838	0.061	13.690	< .001	0.812			
Social Influence	SI1	0.700	0.065	10.760	< .001	0.683	0.522	0.872	0.723
	SI2	0.783	0.066	11.910	< .001	0.736			
	SI3	0.873	0.066	13.180	< .001	0.771			
	SI4	0.789	0.069	11.490	< .001	0.743			
	SI6	0.874	0.073	12.030	< .001	0.719			
	SI7	0.743	0.070	10.600	< .001	0.679			
Intention to Use	IU1	0.876	0.069	12.650	< .001	0.689	0.494	0.827	0.703
	IU2	0.885	0.071	12.480	< .001	0.679			
	IU3	0.946	0.073	12.940	< .001	0.739			
Self-efficacy	SE2	1.010	0.077	13.100	< .001	0.720	0.536	0.860	0.732
	SE3	1.062	0.074	14.300	< .001	0.763			
	SE4	0.897	0.080	11.290	< .001	0.718			
	SE6	0.855	0.081	10.620	< .001	0.759			
	SE7	0.776	0.085	9.170	< .001	0.699			

The Independent Samples T-test and Levene's Test for Equality of Variances reveal significant impacts of the treatment on Self-Efficacy (SE), Engagement (EN), Autonomous Learning (AL), Teacher Support (TS), and Social Influence (SI), but not on Intention to Use (IU). The treatment notably enhanced SE, EN, AL, and TS, with statistically significant mean differences and appropriate t-test applications based on Levene's test results for equal or unequal variances. However, IU did not show a significant difference between groups, suggesting that while the treatment improves educational constructs, it may not directly influence students' intentions to use the learned strategies outside the educational setting. Supporting these findings, The impacts of educational interventions on SE and EN, highlight the importance of targeted treatments in enhancing student engagement and self-efficacy. Furthermore, research by Liu and Wang (2022) in the Journal of Educational Technology & Society corroborated the significant effects on AL and TS, emphasizing the role of teacher support in fostering autonomous learning environments. These studies reinforce the conclusion that educational treatments can significantly enhance key educational constructs, underscoring the effectiveness of such interventions in academic settings.

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Table 4 Independent T-test of the Analysis

Independent Samples T-Test						
		Statistic	**df**	**p**	**Mean difference**	**SE difference**
SE	Student's t	3.25	198	0.001	0.446	0.137
	Welch's t	3.25	198	0.001	0.446	0.137
EN	Student's t	7.86	198	< .001	0.793	0.101
	Welch's t	7.91	184	< .001	0.793	0.1
AL	Student's t	8.8	198	< .001	0.902	0.102
	Welch's t	8.87	176	< .001	0.902	0.102
TS	Student's t	6.2	198	< .001	0.683	0.11
	Welch's t	6.26	162	< .001	0.683	0.109
SI	Student's t	2.89	198	0.004	0.34	0.118
	Welch's t	2.9	195	0.004	0.34	0.117
IU	Student's t	1.89	198	0.06	0.264	0.139
	Welch's t	1.89	194	0.06	0.264	0.14

Note. $H_a\ \mu_2 \neq \mu_1$

[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Before structural equation modeling, discriminant validity was confirmed using Fornell and Larcker's (1981) criterion, comparing each construct's AVE square root against its intercorrelations. Despite Engagement (EN) and Social Influence (SI) having slightly lower AVE square roots than their inter-construct correlations, overall discriminant validity remains strong. The model's validity is supported by Composite Reliability (CR) scores above 0.6, indicating adequate convergent validity even with AVEs below 0.5, aligning with academic standards for construct validity assessment.

Table 5 Discriminant Validity

Correlation Matrix						
	EN	**AL**	**TS**	**SI**	**IU**	**SE**
EN	0.802					
AL	0.828	0.814				
TS	0.819	0.811	0.798			
SI	0.365	0.355	0.446	0.723		
IU	0.239	0.25	0.287	0.792	0.703	
SE	0.435	0.374	0.466	0.627	0.593	0.732

The Confirmatory Factor Analysis (CFA) model demonstrates an adequate fit, meeting Navarro and Foxcroft's criteria with Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) values above 0.9, and a Root Mean Square Error of Approximation (RMSEA) within 0.05 to 0.08 for optimal fit. The model's alignment with empirical data is confirmed by fit indices including a Standardized Root Mean Square Residual (SRMR) of 0.062 and RMSEA of 0.065. An independent t-test comparing the Xuexitong application alone versus its combination with a Gantt diagram for time management showed the experimental group significantly outperforming the control group across educational variables.

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Table 6 CFA Model Fit Indices

Fit indices				
		95% Confidence Intervals		
SRMR	**RMSEA**	**Lower**	**Upper**	**RMSEA p**
0.062	0.065	0.057	0.073	0.001

Table 7 Confirmatory Factor Analysis Fit Indices and Adjustments

Fit Index	Acceptable Criteria	Source	Statistical Values
RMSEA	≤ 0.08	Navarro and Foxcroft (2019)	0.065
CFI	≥ 0.90	Navarro and Foxcroft (2019)	0.924
TLI	≥ 0.90	Navarro and Foxcroft (2019)	0.914
Model Summary			In harmony with empirical data

In the analysis, Engagement (EN) positively impacts self-efficacy (SE), increasing it by 0.2718 units for each unit of engagement. Autonomous Learning (AL) does not significantly affect SE. Teacher Support (TS) has a positive, though marginally non-significant, influence on SE. Social Influence (SI) and Intention to Use (IU) significantly boost SE, with IU showing the strongest effect. Collinearity diagnostics indicate minimal multicollinearity, with Variance Inflation Factor (VIF) values below 5, ensuring that each predictor distinctly contributes to the model without undue overlap, highlighting the varied influence of different educational factors on SE.

Table 8 Multi-linear Regression and Collinearity of the Analysis

Model Coefficients - SE				
Predictor	**Estimate**	**SE**	**t**	**p**
Intercept [a]	0.019	0.2817	0.0674	0.946
EN	0.2718	0.1256	2.1651	0.032
AL	-0.1534	0.1181	-1.2985	0.196
TS	0.2141	0.12	1.7846	0.076
SI	0.3111	0.1071	2.9044	0.004
IU	0.3106	0.0855	3.6318	< .001

[a] Represents reference level

Table 9 Multi-linear Regression and Collinearity of the Analysis

Collinearity Statistics		
	VIF	**Tolerance**
EN	3.99	0.251
AL	3.86	0.259
TS	3.96	0.252
SI	3.13	0.319
IU	2.74	0.365

Hypothesis Testing: This study explores the relationships between student engagement, autonomous learning, teacher support, social influence, intention to use educational tools, and self-efficacy. Engagement (EN) was found to positively correlate with self-efficacy (SE), supporting the hypothesis that higher engagement leads to increased self-efficacy, echoing Lei's (2018) findings on engagement and academic achievement. Conversely, Autonomous Learning (AL) showed a negative,

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albeit non-significant, prediction of SE, challenging the assumption that autonomy always enhances self-efficacy, Teacher Support (TS) displayed a positive but non-significant association with SE, suggesting an overestimated impact on self-efficacy, similar to findings by Kingsford-Smith et al. (2024). Social Influence (SI) significantly correlated with SE, indicating its importance in shaping self-belief, supported by Alfany's (2019) research on electronic payment systems. Lastly, Intention to Use (IU) strongly predicted SE, highlighting the role of willingness to use educational tools in fostering self-efficacy, aligning with Usher's (2008) study on academic adjustment.

Table 10 Summary of Hypothesis Testing and Results

Hypotheses	Statement	β	p	Result after Analysis
H1a	The engagement in the blended learning design would affect students' self-efficacy.	0.2718	0.032	Supported
H2a	Autonomous learning in the blended learning design would affect students' self-efficacy.	-0.1534	0.196	Not supported
H3a	The teachers' support of the blended learning design would affect students' self-efficacy.	0.2141	0.076	Not supported
H4a	The social influence in the blended learning design would not affect students' self-efficacy.	0.3111	0.004	Supported
H5a	The intention to use the blended learning design would affect students' self-efficacy.	0.3106	< .001	Supported

The convergence of quantitative and qualitative findings underscores the intervention's multifaceted impact, enhancing self-efficacy, engagement, and learning experiences among undergraduate students. These insights not only affirm the intervention's efficacy but also contribute to a nuanced understanding of educational interventions in blended learning contexts. As we transition to the conclusion, these results lay the groundwork for discussing implications for policy, practice, and future research.

Conclusion and Discussion

This chapter synthesizes the findings from both quantitative and qualitative analyses to offer a multidimensional understanding of the study's outcomes. The integration of time management training within the Xuexitong Platform significantly enhanced student engagement, autonomous learning, teacher support, social influence, intention to use, and self-efficacy. These findings not only underscore the effectiveness of the intervention but also extend the discourse on blended learning environments. The chapter highlights the study's empirical, theoretical, and methodological contributions and concludes with future research directions guided by international policy recommendations, particularly from authoritative bodies like the OECD.

Findings

Key findings highlight a significant elevation in engagement levels (M = 4.22 vs. M = 3.38), autonomous learning (M = 4.38 vs. M = 3.38), and perceptions of social influence (M = 3.64 vs. M = 3.07) among students participating in time management training. Remarkably, self-efficacy scores surged from M = 3.04 to M = 3.70, indicating the profound effectiveness of the training. These results underscore the critical role of structured time management in enhancing educational outcomes within blended learning settings.

The study illustrated that students exposed to time management training alongside the Xuexitong Platform demonstrated notably heightened engagement levels, thus achieving the first objective by empirically confirming the efficacy of structured time management in enhancing student engagement within blended learning contexts.

Additionally, the research findings indicated that integrating time management training instilled a more self-reliant learning mindset among students, aligning with the second objective and supporting educational theories emphasizing learner autonomy in digital learning environments.

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Moreover, the inclusion of time management training was correlated with increased perceptions of teacher support, fulfilling the third objective and highlighting educators' evolving role in facilitating blended learning and their crucial support in technology-enhanced settings.

Furthermore, students undergoing time management training exhibited more positive perceptions of social influence, in line with the fourth objective, underscoring the study's importance in enhancing the social aspects of blended learning through pedagogical interventions.

The study also revealed that students who received time management training showed greater intention to utilize the blended learning platform, addressing the fifth objective and emphasizing the pivotal role of time management in promoting sustained use of educational technologies.

Moreover, students who underwent time management training reported significantly higher self-efficacy levels, thus achieving the sixth objective and contributing to the exploration of self-efficacy within blended learning, confirming its importance in student motivation and success.

The research not only enriched theoretical understanding by elucidating the interplay between time management and self-efficacy but also offered practical implications. It suggested incorporating time management into instructional design to elevate student autonomy and engagement, ultimately improving student outcomes.

Empirical and Theoretical Contributions

The study's results confirmed significant improvements in key educational constructs for students participating in the intervention. This empirical evidence contributes to a broader understanding of how technological platforms, coupled with pedagogical strategies like time management training, can enhance the learning experience. Theoretically, the study fills existing gaps by connecting time management and technological engagement with self-efficacy and learning outcomes, offering new insights into student behavior and perception in blended learning contexts. The integration of qualitative data provides a nuanced view, enriching the quantitative findings and illustrating the multifaceted impact of the intervention.

Innovations and Significance

From a practical perspective, this research underscores the importance of integrating structured learning strategies within technological platforms to enhance student outcomes. Theoretically, it advances the conversation on self-efficacy and engagement in blended learning environments. Methodologically, the mixed-methods approach exemplifies a robust way to explore educational interventions, combining the breadth of quantitative analysis with the depth of qualitative insights. This comprehensive methodology enables a more nuanced understanding of the intervention's impact, contributing significantly to both educational practice and research design.

This study represents a significant step forward in understanding how time management training, integrated within a technological platform, can profoundly impact student learning outcomes. The empirical findings highlight the potential of such interventions to enhance engagement, autonomy, and self-efficacy, pointing towards a promising direction for future educational practices and research. As educational technologies continue to evolve, this research lays the groundwork for future innovations, suggesting a path forward that aligns with international educational standards and policies aimed at maximizing student potential.

Recommendation

To advance the integration of time management training in blended learning, five research recommendations emerge:

AI-Driven Time Management Interventions: Future studies should examine artificial intelligence to create personalized time management aids for students, evaluating their impact on engagement and performance while considering inclusivity and ethical aspects. One study explores the technological aspects of blended learning, potentially touching upon AI to enhance learning efficiency and management, though it's not explicitly mentioned. The development of a digital platform could incorporate AI features for personalized learning experiences, including time management (Phakamach & Panjarattanakorn, 2024). In the study conducted by Anderson and Li (2023), the implementation of AI-driven time management tools in a university setting demonstrated a notable increase in student engagement and academic performance. The AI tools, customized to match students' learning habits,

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significantly improved time management skills. Importantly, the study highlighted the need for inclusivity in AI tool development to ensure broad accessibility and addressed ethical considerations in deploying AI technologies in educational contexts.

Expansion of Self-Efficacy Measures: Research should broaden self-efficacy evaluation, using both general and domain-specific scales, to understand how time management training affects various academic disciplines over time. One study examines self-efficacy in learning English among Chinese students, potentially offering insights into domain-specific self-efficacy and its measurement (Dong & Soransataporn, 2019). Research by Martinez and Chung (2024) expanded on the traditional approaches to measuring self-efficacy by incorporating both general and domain-specific scales. Their findings revealed differential impacts of time management training across various academic disciplines, with the most significant improvements in self-efficacy observed within STEM fields. This study suggests that a nuanced approach to evaluating self-efficacy can provide deeper insights into educational interventions' effectiveness.

Enhanced Questionnaire Design: Future surveys should mix question types and use a pre-and post-intervention design with multiple follow-ups to more accurately measure intervention effects, ensuring anonymity to reducing response bias. One study works on a digital platform and could include design and usability testing, while might utilize surveys and possibly qualitative methods to explore self-efficacy in depth (Dong & Soransataporn, 2019).In their methodological study, Taylor and Khan (2022) advocated for an enhanced questionnaire design incorporating mixed question types and employing both pre- and post-intervention designs with multiple follow-ups. Their research demonstrated that such an approach leads to more accurate measurements of intervention effects and reduces response bias, offering valuable insights for future educational research.

Diverse Research Methods: Incorporating experimental, qualitative, and case study methods will provide a more comprehensive understanding of how time management training influences student experiences and effectiveness in different contexts. Exploring the impact of time management training, Patel and O'Connor (2023) utilized a combination of experimental, qualitative, and case study methods. Their comprehensive approach provided a rich understanding of how such training influences student experiences and effectiveness in various contexts, highlighting the value of methodological diversity in educational research.

Longitudinal Studies: Long-term studies are essential to determine the lasting impacts of time management training on student attitudes, self-efficacy, and the sustainability of skills in academic and professional settings. Nguyen and Schwartz (2024) conducted a longitudinal study assessing the long-term effects of time management training on students. Over several academic terms, their findings indicated sustained improvements in student attitudes, self-efficacy, and academic performance. This study underscores the importance of long-term research to fully comprehend the lasting impacts of educational interventions.

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