Crafting E-Learning Pathways: A Student's Insight into the Course 'Understanding Disciplines and School Subjects' Offered in Teacher Education in Cuddalore District of Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

A conceptual framework enhances the understanding of the research problem and facilitates the organisation of the study. Currently, technology is revolutionising education through innovative methods of teaching and learning. E-learning has revolutionised education through online platforms, digital documents, and other electronic resources. In the interest of filling a large void in

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the existing body of research on the subject, this study focuses on the viewpoints of B.Ed students regarding the usage of e-learning tools for the course 'Understanding Disciplines and School Subjects' offered in the B.Ed programme. Study Sample: The researchers chose a sample of 540 students enrolled in the B.Ed. programme at Tamil Nadu Teachers Education University in the Cuddalore district of Tamil Nadu in 2023. The study employed a purposive sampling technique. Research Design: This study employed qualitative approaches, utilising surveys as the primary data collection method. The analysis of open-ended questions was conducted through content analysis. Data Collection Tools: The study used an open-ended questionnaire to collect data. It was found that students' replies related to positive and negative points for e-learning were evenly distributed. Eight suggestions were made to enhance the quality of e-learning resource production. Recommendations: To enhance comprehension of "Understanding Disciplines and School Subjects," it is advisable to develop e-learning resources in Indian languages. The e-learning producer's content knowledge and technical expertise are essential.

1. INTRODUCTION

A conceptual framework makes comprehending the research problem and organising the study much simpler and more accessible. Today, education is being revolutionised by ways of teaching and learning that are driven by technology. Education has been revolutionised by the advent of e-learning, which uses online platforms, digital documents, and other electronic resources. In this setting, B.Ed. students who will one day become teachers need to be questioned regarding using e-learning tools for professional development.

In teacher education programs, in particular those leading to a Bachelor of Education degree, an emphasis is placed on both discipline and topic knowledge. Aspiring educators acquire the foundational knowledge and pedagogical abilities to instruct various curricular areas. As a result of technological advancements, educators now have access to an increasing number of e-learning materials and resources to teach students on this topic. Learning and understanding are facilitated by many forms of digital information, such as interactive modules and multimedia presentations.

The thoughts and feelings of B.Ed students towards e-learning materials are fundamental since they will significantly impact the direction that educational technology will take in the future. Their prior experiences as students directly inform the methods that they employ in their teaching. Therefore, it is imperative to investigate and better understand how B.Ed. Students perceive and interact with e-learning materials created for Understanding Disciplines and School Subjects.

2. RELEVANCE OF RESEARCH

In the interest of filling a large void in the existing body of research on the subject, this study focuses on the viewpoints of B.Ed students regarding the usage of e-learning tools for the course 'Understanding Disciplines and School Subjects' offered in B.Ed programme. It is crucial, for several reasons, to gain an understanding of the viewpoints of these aspiring educators: According to the findings of a study by Padmini & Ramani [1]. B.Ed. students find it challenging to comprehend some aspects of the course 'Understanding Disciplines and School Subjects.'

Improving Teacher Preparation: The findings of this study can be used by teacher education programs and curriculum designers to inform the process of creating e-learning resources to enhance teachers' readiness for their duties in a digitalised educational landscape. Influential e-learning content creators can produce resources that more closely correspond with future educators' expectations and learning styles if they understand the preferences and needs of B.Ed students. The experiences that B.Ed students have with e-learning materials can also influence their attitudes towards continued professional development throughout their teaching careers and help promote lifelong learning.

Improving Educational Technology Rules: The establishment of rules and guidelines for digital education at the pre-service level can be informed by insights into how B.Ed students view the integration of e-learning. These insights can help policymakers improve educational technology policies.

3. REVIEW OF RELATED LITERATURE

The Investigators reviewed about fourteen studies related to the following topics.

i. Research that is generally associated with e-learning.
ii. Research in the field of Bachelor of Education about e-learning.
iii. Research about e-learning in a variety of B.Ed. topics.
iv. Research about a variety of topics included in the B.Ed.
v. Research in the Bachelor of Education program about "understanding disciplines and school subjects."

3.1 Research that is Generally Associated with E-Learning

Mamattah [2] examined students' e-learning attitudes. This thesis examines student views on e-learning, an alternative to classroom instruction. Technology has made e-learning easier, prompting the investigation. Since students are the primary beneficiaries, student insights were essential. The study included 80 questionnaires at Ghana's HO Polytechnic. According to the study, most students think e-learning is creative and should be supported. A small percentage of students worry about employment discrimination from e-learning. Participants also preferred hybrid learning, which combines online and in-person instruction. According to the survey, Ghanaian schools should invest in e-learning resources over satellite campuses because pupils desire mixed learning.

Thakkar and Joshi [3] examined student perceptions toward E-learning. Teaching and learning are increasingly using technological techniques. Due to its large population and inadequate educational resources, E-learning could meet India's growing educational needs. E-learning success depends on student preparation. E-learning has several benefits, but its success depends on students' adaptability. This study examines engineering diploma students' e-learning perspectives. Surveys are used in this investigation. The sample included 56 diploma engineering information technology students. The data was collected using an attitude scale. A comparative analysis examined student attitudes toward E-learning by gender, locality (rural/urban), and caste (General/Reserved).

Encarnacion, Galang, and Haller [4] E-learning was studied for its effects on teaching and learning. This article evaluates e-learning's impact on Oman Tourism College's Undergraduate Program (UGP) and General Foundation Program (GFP) in Muscat, Oman. Approach – A mixed strategy was used to evaluate teachers' and students' E-Learning experience through online surveys. E-learning efficacy was assessed using five effectiveness indicators. The study used the five components to determine instructor and student consensus on E-Learning efficacy. The study explored student and teacher views on E-Learning. E-learning's impact on instruction and education was also examined.

Faculty and student attitudes to online learning were studied. The COVID-19 pandemic has disrupted many schools. The study assessed academic institutions' crisis management and response. During the pandemic, Jordan's primary form of schooling is online. After four months of online education, professors and students completed two surveys to evaluate the learning experience. Faculty and students' online learning opinions were assessed using two surveys. Jordan's online education's pros and cons were examined by randomly assigning 50 instructors and 280 students. Zoom, Microsoft Teams, and WhatsApp were Jordan's leading internet platforms for interactive classrooms and student communication. The study found that professors and students believe online education has helped throughout the pandemic. Online learning and instruction are less effective than face-to-face techniques. Faculty and students worry about online learning issues. Deaf and hard-of-hearing students face difficulty adjusting to online education. Other concerns include limited contact and motivation, technological and Internet limitations, data privacy, and security. Everyone agreed on online learning's benefits. Self-directed learning, affordability, usability, and adaptability were the key benefits. Online learning is a temporary solution during the COVID-19 pandemic but cannot replace in-person learning. The study suggests using blended learning to encourage rigorous learning. Mohsen Almahasees, Amin , [5]

Gopal, Singh, and Aggarwal [6] evaluated how online classes affected student happiness and performance during the COVID-19 epidemic. In light of the COVID-19 epidemic, this study examines the relationship between student pleasure and academic performance in online

courses. In an online poll, 544 Indian university students studying business management (B.B.A or M.B.A) or hotel management provided quantitative data. They are analysing hypotheses with structural equation modelling. Four characteristics improve student satisfaction and academic achievement, according to the study. These aspects include instructor quality, course design, timely feedback, and student expectations. Educational administration must examine four factors to ensure online course satisfaction and performance. This study is being undertaken during the COVID-19 epidemic to examine how online education affects student achievement.

Muthuprasad, Aiswarya, Aditya, and Jha [7] evaluated Indian students' views on online education. Due to the COVID-19 pandemic, educational institutions worldwide have had to close, disrupting academic calendars. Most schools use online learning tools to manage academic activities. However, e-learning preparation, design, and efficiency must be addressed, especially in a growing nation like India. Technological constraints like device appropriateness are essential owing to bandwidth availability. This study surveyed 307 agriculture students online on online learning. We analysed student preferences for online class features to help them create effective learning environments. The research showed that 70% of respondents preferred online classes to navigate the curriculum throughout the pandemic. Most pupils preferred cell phones for online learning. Content analysis shows that students prefer recorded courses with end-of-class tests to improve their learning experience. Students said online classes are flexible and convenient, although isolated areas have restricted connectivity. In agricultural education, where most of the curriculum is hands-on, going online may take time and effort. This article could help create a hybrid learning curriculum.

Ninsiana et al. [8] E-learning attitudes of high school students are examined in this study. This study examined how online learning affects high school English competency. The study involved 50 intermediate students and 73 OQPT takers. Participants were then randomly assigned to experimental (EG) (n=25) and control (CG) (n=25) groups. After a generic English pretest, the experimental group (EG) received WhatsApp. We got three Vision Book 3 lessons via WhatsApp. We are recruiting for online computer graphics classes—personalised learning. After three lessons, both groups took the general English posttest. E-learning attitude questionnaires, and interviews were given to 10 students. The posttest showed that the experimental group (EG) outperformed the control group. EFL students prefer e-learning for English instruction, according to the one-sample test. According to interviews, E-learning problems included computer proficiency, screen concentration, and inadequate Internet connectivity.

3.2 Research in the Field of Bachelor of Education about E-Learning

Nath & Bairagya [9] conducted a study titled 'B.Ed. Trainees' Attitude Towards E-Learning about their ICT Familiarity in Birbhum and Purba Medinipur District. This study compares B.Ed. students' ICT expertise and E-learning attitudes. This study measures B.Ed. teacher trainees' ICT knowledge and access. The study studied literacy, anxiety, and ICT access. B.Ed. trainees' access to ICT, knowledge, anxiety, E-learning environment, and attitudes toward E-learning is also examined depending on background variables, including gender, age, method subject, and institution type. The research was descriptive and differential. The inquiry focused on three B.Ed. institutions. This study used simple random sampling. A study recruited 96 B.Ed. students. Information on ICT access, knowledge, anxiety, and attitude toward e-learning technologies. For data analysis, a t-test determined participant group differences' statistical significance. Statement acceptance or rejection depends on T-test results. The study indicated that B.Ed. teacher trainees have limited ICT access and expertise, regardless of gender, age, optional subject, or institution. B.Ed. teacher trainees need more ICT access; therefore, additional practical ICT skills training may be beneficial. ICT should be highlighted in a teaching and learning awareness program. Email, blogs, and social media may stimulate teacher trainees to communicate with educators. Though available, teachers and students neglect PowerPoint slides and movies for various educational levels. When creating digital education approaches, authorities must prepare.

Srivastava [10] conducted A Study on the Attitude of B.Ed. Pupil Teachers Towards E-Learning in 2023. This study examines B.Ed. student teachers' E-Learning perspectives. The research used descriptive survey methods. This survey includes all B.Ed. students from self-

financed and government institutions associated with state and central universities in Varanasi. A sample of 100 B.Ed. students from Central and State universities were chosen. A sample of 50 self-financed and 50 government-funded students is equal. Selection will employ stratified random sampling. The average e-learning score was 294. B.Ed. student teachers like e-learning, according to the average score. No gender or school management difference was found. Geographical differences occurred.

3.3 Research about E-Learning in a Variety of B.Ed. Topics

ReechaJrall and Kiran [11] studied in 2022. The project developed and tested an e-content module to help B.Ed students understand "ICT and its Application". Electronic content is popular in education because it allows students and teachers to tailor learning. An E-Content module was built, validated, and reviewed to teach Bachelor of Education ICT students. A single group was assessed before and after testing. A random sample of 52 B.Ed student-teachers was chosen. This data was collected using the E-Content Module and achievement tests. E-content module effectiveness was examined using pre- and post-intervention achievement tests. Electronic content improves B.Ed students' academic achievement. According to research, instructors should use this method to engage potential teachers.

Anand [12] undertook "An Evaluative Study of the B.Ed. Curricula Operative in Universities with Specific Reference to Environmental Education." in 2023. This study examines environmental education's history, growth, and impact on teacher education. India is the subject of the study on global ecological issues. This study examines how individuals and environmental organizations address these issues. The study design includes title, objectives, key terms, delimitations, population, sample, data collection, and analysis. The B.Ed. Program has two data collecting, research, and interpretation components. Second-year B.Ed. students assess the environmental education curriculum. Using a proprietary questionnaire, the program assesses pre-service teachers' environmental education knowledge, awareness, and attitude.

Padmini & Ramani [1] conducted a study on Perceptions of B.Ed Students on the Course of 'Understanding the Disciplines and Academic Subjects' Offered in Teacher Education Programs. Teacher education programmes like the Bachelor of Education (B.Ed.) aim to deepen and enrich comprehension of many academic fields. Tamil Nadu Teachers Education University's B.Ed programme requires a solid grasp of numerous areas. What do B.Ed students think of the subtopics of 'Understanding Disciplines and School Subjects' at Tamil Nadu Teachers Education University? Objective: To examine B.Ed students' opinions of Tamil Nadu Teachers Education University's "Understanding Disciplines and School Subjects" course. Study Population: B.Ed. students from Tamil Nadu Teachers Education University in Cuddalore in 2023 were the study population. About 3,000 students study B.Ed in 30 colleges in Cuddalore, Tamilnadu. Study Sample: In 2023, 523 randomly selected B.Ed. Tamil Nadu Teachers Education University students from Cuddalore were studied. Cluster sampling was used in this investigation. Five of thirty colleges were randomly selected for inquiry. Study Hypothesis: Null Hypothesis: B.Ed. students' views on 'Understanding Disciplines and School Subjects' are not statistically different. The study's findings will help educators improve pedagogical methods and alter the teaching-learning process to make education more understandable, especially for B.Ed students who want to teach. The B.Ed programme offers "Understanding the Disciplines and Academic Subjects" for this. This study evaluates students' course perceptions and subtopic comprehension problems. What are the research questions? How do B.Ed students view 'Understanding'?

3.4 Research about a Variety of Topics Included in the B.Ed

Fatima and Naaz [13] conducted a study to analyze B.Ed. Geography academic performance and subject enrichment using interactive learning approaches. This study compared the average content examination results of B.Ed. trainees in experimental and control groups and between male and female participants. The study used a "two-group post-test design". Using deliberate sampling. Out of 130 B.Ed. Geography majors, 70 were tested. The experimental group received knowledge-enhancing treatment, while the control group received standard training. This study found that interactive learning improved B.Ed. students' topic understanding and academic performance.

3.5 Research in the Bachelor of Education Program about 'Understanding Disciplines and School Subjects'

Matthiessen [14] studied Register cartography, explicitly focusing on Giovanni Parodi's research on Registerial profiles of school subjects and university disciplines. This section pertains to the registration process for schools and universities. The study conducted by Giovanni Parodi focuses on university discipline registerial profiles while also examining systematic functional school topic profiles. These two aspects complement each other. These groundbreaking contributions shape the comprehensive perspective, allowing future research to address the gaps as personal registration repertoires grow. This study aims to clarify the concepts of 'register' and 'genre' about situational language functional variation.

Thompson [15] in the edited book "Subject Disciplines and the Construction of Teachers' Identities." This chapter explores the influence of disciplinary identification on teachers' identities. The chapter emphasizes the importance of teachers imparting their subject matter to students with moral and pedagogical considerations. Teachers must possess a comprehensive understanding of subject concepts and evidence, regardless of their area of specialization. This chapter suggests that teachers' sociocultural identities are influenced by their conceptual understanding of teaching a specific topic in particular situations. This chapter examines various subjects and teachers' identities, focusing on beginning English teachers as a case study to explore the challenges faced by subject disciplines, school subjects, and teacher identities.

Hudson, Gerickeb, Schellerc, and Political [16] conducted a study analyzing the transformations of disciplines across school subjects, focusing on trajectories of powerful knowledge and epistemic quality. This study introduces a research paradigm in comparative topic didactics and investigates changes in academic disciplines across different school subjects. The theoretical framework conceptualizes the transition from the classroom to society as encompassing the notions of 'powerful knowledge', 'transformation', and 'epistemic quality'. The empirical studies conducted within the Knowledge and Quality across School Subjects and Teacher Education (KOSS) network are analyzed within a specific framework.1. Footnote1. This study investigates discipline transitions within different school subjects, focusing on the concept of powerful knowledge, which refers to specialized information that is created and transferred. Frontier empirical study data is analyzed using broad subject categories. This study compares higher education disciplines using the widely used Biglan classification approach. In conclusion, we address curriculum planning, teacher education policy, and subject-specific educational content understanding.

4. YEAR-WISE ANALYSIS OF THE REVIEWED LITERATURE

About sixteen different studies were examined by the researchers. Table 1 provides a comprehensive overview of the numerous research by tabulating them according to the year they were conducted.

From Table 1, the following research gap was identified, and it is elaborated on in the following paragraph.

5. IDENTIFYING THE RESEARCH GAP AND RATIONALE OF THE STUDY

This type of research is valid, according to studies by Mamattah [2], Thakkar & Joshi [3], Encarnacion, Galang, & Hallar (2020), Ninsiana et al. [8], and Srivastava [10] that reviewed the literature on e-learning, its effectiveness, and its use in education, particularly in the context of teacher education. They also discussed how students feel about using e-learning tools and their preferences. Researchers examined e-learning research carried out throughout the COVID-19 period. The evidence from the studies by Almahasees, Mohsen, & Amin [5], Gopal, Singh, & Aggarwal [6], and Muthuprasad, Aiswarya, Aditya, & Jha [7] demonstrates the value of online learning during the pandemic. Additionally, researchers examined B.Ed. Studies on e-learning in several topics. Studies by Fatima & Naaz [13], ReechaJrall & Kiran [11], and Anand [12] discovered that it is advantageous for teaching and studying courses available in B.Ed. Researchers looked at works on understanding disciplines and school subjects by Matthiessen [14], Thompson [15], Hudson, Gerickeb, Schellerc, and Political (2023) to understand the particular difficulties and requirements associated with each. The study indicated that B.Ed. teacher trainees have limited ICT access and expertise, regardless of gender, age, optional subject, or institution (Nath & Bairagya, 9). Although e-learning has been the

topic of studies at the B.Ed level, there have been none on "Understanding Disciplines and School Subjects." It is crucial to research B.Ed students' perspectives on creating e-learning materials in the context of 'Understanding Disciplines and School Subjects.'

Table 1. Year-wise analysis of the review conducted

S.No	Author	Topic	Findings of the study
1	Fatima and Naaz[13]	Analysed B.Ed. Geography academic performance and subject enrichment using interactive learning approaches	This study found that interactive learning improved B.Ed. students' topic understanding and academic performance.
2	Mamattah [2]	Examined students' e-learning attitudes	According to the survey, Ghanaian schools should invest in e-learning resources over satellite campuses because pupils desire mixed learning.
3	Thakkar and Joshi [3]	Examined student perceptions toward E-learning	.A comparative analysis examined student attitudes toward E-learning by gender, locality (rural/urban), and caste (General/Reserved).
4	Nath & Bairagya [9]	study titled 'B.Ed. Trainees' Attitude Towards E-Learning in Relation to their ICT Familiarity	Though available, teachers and students neglect PowerPoint slides and movies for various educational levels. When creating digital education approaches, authorities must prepare.
5	Encarnacion, Galang, and Haller [4]	E-learning was studied for its effects on teaching and learning	The study explored student and teacher views on E-Learning. E-learning's impact on instruction and education was also examined.
6	Gopal, Singh, and Aggarwal [6]	Evaluated how online classes affected student happiness and performance during the COVID-19 epidemic	They analysed hypotheses with structural equation modelling. Four characteristics improve student satisfaction and academic achievement, according to the study.
7	Matthiessen [14]	Studied Register cartography, explicitly focusing on Giovanni Parodi's research on Registerial profiles of school subjects and university disciplines	focuses on university discipline registerial profiles while also examining systematic functional school topic profiles
8	Mohsen Almahasees, Amin , [5]	Faculty and student attitudes to online learning were studied.	Other concerns include limited contact and motivation, technological and Internet limitations, data privacy, and security. Everyone agreed on online learning's benefits. Self-directed learning, affordability, usability, and adaptability were the key benefits.
9	Muthuprasad, Aiswarya, Aditya, and Jha [7]	Evaluated Indian students' views on online education	Students said online classes are flexible and convenient, although isolated areas have restricted connectivity.

S.No	Author	Topic	Findings of the study
10.	Ninsiana et al. [8]	E-learning attitudes of high school students are examined in this study.	The posttest showed that the experimental group outperformed the control group. EFL students prefer e-learning for English instruction, according to the one-sample test.
11	ReechaJrall and Kiran [11]	Studied in 2022. The project developed and tested an e-content module to help B.Ed students understand "ICT and its Application"	Electronic content improves B.Ed students' academic achievement. According to research, instructors should use this method to engage potential teachers
12	Anand [12]	Undertook "An Evaluative Study of the B.Ed. Curricula Operative in Universities	Using a proprietary questionnaire, the program assesses pre-service teachers' environmental education knowledge, awareness, and attitude.
13	Hudson, Gerickeb, Schellerc, and Political [16]	Conducted a study analyzing the transformations of disciplines across school subjects	This study compares higher education disciplines using the widely used Biglan classification approach.
14	Srivastava[10]	Conducted A Study on the Attitude of B.Ed. Pupil Teachers Towards E-Learning	No gender or school management difference was found. Geographical differences occurred.
15	Padmini & Ramani [1]	Conducted a study on Perceptions of B.Ed Students on the Course of 'Understanding the Disciplines and Academic Subjects'	The study's findings will help educators improve pedagogical methods and alter the teaching-learning process to make education more understandable, especially for B.Ed students who want to teach
16	Thompson [15]	In the edited book "Subject Disciplines and the Construction of Teachers' Identities."	This chapter explores the influence of disciplinary identification on teachers' identities.

6. RESEARCH PURPOSE

- The main objective of this study is to examine the perceptions of B.Ed. students towards e-learning resources to enhance their understanding of various disciplines and academic subjects. This study aims to assess the efficacy of e-learning resources in facilitating subject comprehension through a systematic analysis of participants' perspectives.
- Analyse their preferences and previous experiences with different types of e-learning content.
- Identify barriers or challenges encountered when utilising e-learning resources.
- This study aims to identify the limitations of e-learning resources to enhance their effectiveness in supporting students' teacher-education endeavours.

7. RESEARCH PROBLEM AND OBJECTIVES

7.1 Research Problem

Crafting E-Learning Pathways: A Student's Insight into the course 'Understanding Disciplines and School Subjects' offered in Teacher Education in Cuddalore district of Tamilnadu

7.2 Research Questions

- What is teacher education students' perception of the effectiveness of e-

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learning pathways in comprehending various disciplines and school subjects?

- What challenges and barriers do teacher education students encounter when accessing and engaging with e-learning materials about disciplines and school subjects?
- What resources and support systems are necessary to implement e-learning pathways in teacher education programmes effectively?

7.3 Research Objectives

- To know teacher education students' perception of the effectiveness of e-learning pathways in comprehending various disciplines and school subjects.
- To know the challenges and barriers teacher education students encounter when accessing and engaging with e-learning materials about disciplines and school subjects.
- To know the kind of resources and support systems are necessary to effectively implement e-learning pathways in teacher education programmes.

8. OPERATIONALISATION OF TERMS

8.1 E-Learning Materials

E-learning materials are digital resources, content, and tools created for educational use and delivered electronically, usually via the Internet or computer-based platforms. The educational resources can take various forms, such as text-based content (e-books, articles, PDFs), multimedia content (video lectures, audio lectures, interactive simulations, animations), interactive learning modules, online courses, learning management systems (LMS), online quizzes and assessments, synchronous and asynchronous content, learning apps, and mobile content.

8.2 Understanding Disciplines and School Subjects

This study examines the curriculum and pedagogic studies provided in the B.Ed. degree programme at Tamil Nadu Teachers Education University, focusing on the course understanding disciplines and school subjects.

9. METHODOLOGY

9.1 Population of the Study

All B.Ed. Tamil Nadu Teachers Education University students in the Cuddalore district of Tamilnadu during 2023 constituted the study population. Thirty colleges are offering B.Ed programmes in the Cuddalore district of Tamilnadu—about three thousand students studying in these colleges.

9.2 Sample of the Study

The investigators selected five hundred and forty B.Ed. Tamil Nadu Teachers Education University students in the Cuddalore district of Tamilnadu during 2023 as the study sample.

9.3 Sampling Technique

Purposive Sampling was used for this study. Four colleges were selected to constitute the study sample.

9.4 Research Design

The qualitative study used the survey method, and open-ended questions were analysed using content analysis by summarizing the codes into categories. Content analysis was performed using the summative method.

9.5 Tools for Data Collection

The open-ended questionnaire was used to collect data for this study. Inter-coder reliability was employed to establish the reliability of the questionnaire. Three coders independently analysed the responses, and the level of agreement was assessed by comparing their results. Content validity was ensured in the open-ended questionnaire by selecting open-ended questions that directly align with the research objectives and effectively explore the subject matter.

9.6 Procedure for Data Collection

Investigators prepared an open-ended questionnaire for e-learning in the subject 'Understanding Disciplines and School Subjects'. The questionnaire was tested for reliability and validity. A pilot study was conducted, and the questionnaire was modified accordingly. The

modified questionnaire was used for data collection.

9.7 Data Analysis

Open-ended questions were analysed qualitatively using content analysis.

Section 1. Demographic Information

Twenty-one was the average age of pupils, at thirty-four point eight per cent. Twenty-two per cent of pupils were over the age of twenty-one. Twenty-one per cent of pupils were over the age of twenty-one. Thirteen per cent of pupils were over the age of twenty-one. In class, there were four point three per cent of pupils over the age threshold of twenty-five. The average age of pupils was twenty-seven, or thirteen per cent—a rate of 3. Of students were beyond the period of thirty-three. A total of two per cent of boys in the class and ninety-one per cent were female students.

The following is the data analysis related to Research Question 1: What is teacher education students' perception of the effectiveness of e-learning pathways in comprehending various disciplines and school subjects?

Question 1: I prefer the e-learning resources or tools for learning the subject of 'Understanding Disciplines and School Subjects'; it is better than traditional teaching. (Others, Please Specify).
The following is an analysis of the content of this question:

- The e-learning resources or tools for understanding the topic of 'Understanding Disciplines and School Subjects' are excellent.
- I can only partially agree with the statement that the e-learning materials or tools for understanding the topic of 'Understanding Disciplines and School Subjects' are helpful.
- Using internet films as e-learning resources or tools for learning about 'Understanding Disciplines and School Subjects' is a fantastic idea, and I wholeheartedly support it.
- For education on 'Understanding Disciplines and School Subjects'. Visual learning as e-learning materials or tools is the best approach. For instruction on 'Understanding Disciplines and School Subjects'.

- Books can serve as helpful e-learning materials or tools.
- For instruction on 'Understanding Disciplines and School Subjects, 'Using case studies as e-learning resources or tools is beneficial.
- For education on 'Understanding Disciplines and School Subjects, ' using a computer as an e-learning resource or device is helpful.
- Regarding the topic of 'Understanding Disciplines and School Subjects, ' audio-visual materials and e-learning resources or tools benefit one's education.

The following is the data analysis related to Research Question 2: What challenges and barriers do teacher education students encounter when accessing and engaging with e-learning materials about disciplines and school subjects?

Question 2: Have you faced any challenges before with e-learning materials? If yes, please describe them. (Open-ended).

The following is an interpretation of the content of this question:

- In the past, I have not encountered any difficulties with e-learning materials.
- There were difficulties in comprehending the materials for the online course.
- When it comes to e-learning, I found that independent study was challenging.
- It is dependent on the type of instructional resources that are utilised for online instruction.
- I had to deal with a few challenges here and there.

The following is the data analysis related to Research Question 3: What resources and support systems are necessary to implement e-learning pathways in teacher education programmes effectively?

Question 3: What improvements or additional support could enhance e-learning experiences? (Open-ended).

- Yes, there should be additional support for improving e-learning experiences.
- Proper guidance should be given for using e-learning materials.
- E-learning preparation should be collaborated with faculty from outside the department.

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- Yes, enough internet connections should be available for using e-learning materials.
- There is no additional support needed for improving e-learning experiences.
- Content and subject should be appropriately analysed before the preparation of e-learning material.
- More e-learning materials should be available for teaching and learning purposes.
- E-learning material should be prepared more comprehensively, and multimedia should be used for this purpose.
- E-learning material should be available in various Indian languages.

Question 4: What improvements or additional support could enhance e-learning experiences? (Open-ended).

The following is an analysis of the content of this question:

- Providing sufficient guidance has the potential to enhance the quality of online learning.
- There are opportunities for progress in the field of online education.
- Collaboration among faculty members from various departments can lead to the creation of high-quality e-learning content.
- There is no need to alter the range of the online courses.
- Before commencing the development of e-learning materials, it is imperative to evaluate the content and subject matter comprehensively.
- Increased utilisation of technology is advisable when creating online educational content.
- For optimal understanding of the subject matter, it is recommended to develop e-learning content in the native language of the target audience.
- When creating e-learning content, it is necessary to prioritise enhanced clarity.
- Using virtual mechanisms is advantageous when developing e-learning content.
- Effective communication requires appropriateness.
- A dependable internet connection is essential.

Question 5: Do you have any additional comments or suggestions regarding e-learning and its role in learning the subject 'Understanding Disciplines and School Subjects' as a B.Ed student? (Open-ended).

The following is an analysis of the content of this question —no further remarks.

- Simplicity should serve as the guiding principle.
- Prior knowledge should be taken into account when developing e-learning content.
- The implementation of standardised e-learning materials is necessary.
- There is a need to update the curriculum in e-learning materials.
- It should be classified according to the needs of students.

Comprehensive analysis of answers given by students for various questions

Suggestions given by students for improving e-learning material

10. FINDINGS OF THE STUDY

The content analysis of the open-ended questions found that there were fourteen positive points and fourteen negative points for e-learning resources in understanding the topic of 'Understanding Disciplines and School Subjects'. Positive and negative points are equally distributed. There were eight suggestions to improve the quality of e-learning resource production. For an in-depth understanding of the topic 'Understanding Disciplines and School Subjects, ' e-learning materials should be prepared in Indian languages as well. Content knowledge and technical knowledge of the producer are fundamental.

11. DISCUSSION AND CONCLUSION

This study examines the impact of e-learning pathways on the comprehension of different disciplines and school subjects among teacher education students in the Cuddalore district of Tamil Nadu. According to the study by Padmini & Ramani [1], B.Ed students need help comprehending the course 'Understanding the Disciplines and Academic Subjects'. This study analyses whether e-learning material will help students comprehensively understand this subject. The study conducted by the researchers Fatima and Naaz[13], Mamattah [2], Thakkar and Joshi [3], Nath & Bairagya [9], Encarnacion, Galang, and Haller [4] examined e-learning for its

effects on teaching and learning. The findings of this study have provided insights into various significant aspects of e-learning in teacher education and its influence on students' readiness for the teaching profession. E-learning is now a crucial component of teacher education programmes in the region. Teacher education institutions progressively integrate digital resources and platforms as supplementary tools to traditional teaching methods. Furthermore, teacher education students generally held positive perceptions regarding the effectiveness of e-learning pathways. According to their report, using e-learning materials enhanced comprehension of academic disciplines and subjects, with several individuals perceiving it as a valuable factor in their overall readiness as educators. They also provided recommendations for enhancing the production of e-learning materials for educational purposes.

Table 2. Comprehensive analysis of answers given by students for multiple questions

S.No	Positive points for understanding the topic of 'Understanding Disciplines and School Subjects'	Negative points for understanding the topic of 'Understanding Disciplines and School Subjects'
1	The e-learning resources or tools are excellent.	Students partially agreed with the statement that the e-learning materials or tools are helpful.
2	Using internet films as e-learning resources or tools is fantastic; students wholeheartedly support it.	There were difficulties in comprehending the materials
3	Visual learning as e-learning materials or tools is the best approach	Students found that independent study was challenging.
4	Books can serve as helpful e-learning materials or tools	It is dependent on the type of instructional resources that are utilised for online instruction.
5	Using case studies as e-learning resources or tools is beneficial	Students felt that they had to deal with a few challenges here and there
6	Using a computer as an e-learning resource or device is helpful	There were difficulties in comprehending the materials
7	Audio-visual materials and e-learning resources or tools benefit one's education.	There should be additional support.
8	I have not encountered any difficulties with e-learning materials	Proper guidance should be given for using e-learning materials.
9	Students have not encountered any difficulties with e-learning materials	Learning material should collaborate with faculty from other departments.
10	There is no additional support needed to improve e-learning experiences	Enough internet connections should be available.
11	More e-learning materials should be available for teaching and learning purposes.	Content and subject should be appropriately analysed before the preparation.
12	There are opportunities for progress in the field of online education	It should be prepared more comprehensively, and multimedia should be used
13	Collaboration among faculty members from various departments can lead to the creation of high-quality e-learning content.	E-learning material should be available in various Indian languages.
14	Virtual mechanisms are advantageous.	Providing sufficient guidance has the potential to enhance.

Table 3. Suggestions given by students for improving e-learning material

S.No	Suggestions
1	Prior knowledge should be taken into account when developing e-learning content.
2	The implementation of standardised e-learning materials is necessary.
3	Simplicity should serve as the guiding principle.
4	Before commencing the development of e-learning materials, it is imperative to evaluate the content and subject matter comprehensively.
5	Increased utilisation of technology is advisable for creation.
6	Prioritise to enhance clarity.
7	Effective communication requires appropriateness.
8	E-learning material should be prepared in different Indian languages.

12. LIMITATIONS OF THIS RESEARCH

This study adopted a purposive sampling technique. Therefore, the result cannot be generalised to the whole B.Ed students of Tamilnadu. Future studies can be conducted using mixed research methods using qualitative and quantitative sampling techniques and adopting probability sampling techniques.

13. POLICY RECOMMENDATIONS

Formulate policies to allocate resources to enhance and maintain the technological infrastructure necessary for facilitating e-learning. Providing students and educators with reliable internet connectivity, necessary software, and hardware is essential. Promote the adoption of standardised e-learning platforms and tools among educational institutions. This research could enhance the consistency of e-learning experiences for students. Propose policies that facilitate ongoing professional development for educators, encompassing training in proficient online teaching techniques, curriculum development, and the incorporation of technology. This study has the potential to improve the quality of online education.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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