

Attitudes of Student-Teachers with Disabilities toward Switching to E-exams in Teacher Education

Utpal Debnath

Research Scholar

Department of Education, Central Institute of Education, University of Delhi

Email- utpaldebnath1992@gmail.com

Manuscript Submission Date: August 01, 2025

Manuscript Acceptance Date: December 31, 2025

Abstract

The introduction of new technological opportunities enables transitions and transformations across all communication sectors. The e-examination system brings innovative evolutionary structures, altering mindfulness, increasing accessibility, and improving effectiveness in the assessment process. It aims to explore the perceptions of student-teachers with disabilities regarding the implementation of e-exams during the pandemic. A descriptive research method with a quantitative approach was used to determine the perceptions of student-teachers with disabilities regarding the implementation of e-exams. An e-examination questionnaire was developed, with an acceptable Cronbach's Alpha reliability value of 0.706 and face and content validity established by a field expert. One hundred thirty-two student-teachers with disabilities were selected randomly. An exploratory factor analysis was conducted to investigate the factors related to student-teachers with disabilities' perceptions of e-exams. The "Kaiser-Meyer-Olkin Test," "Bartlett's Test of Sphericity," and "Index of Determinant" were tested at the desired level. The study explored and reconfirmed (using Chi-squared, RMSEA, GFI, CFI, and IFI, with good fitness results indicating fair outcomes) that the factors related to student-teachers with disabilities' perceptions of e-exams involve both "negative personal attitude" and "positive personal attitude". These two factors explained 51.24% of the variance, with "negative personal attitude" being the primary barrier to using online exams compared to "positive personal attitude" for student-teachers with disabilities.

Keyword: Student-teachers with Disabilities, Attitude, e-exams, Teacher Education.

Introduction

Until the COVID-19 pandemic era, formal and informal examination systems were typically conducted in physical mode. However, the COVID-19 outbreak worldwide led to the widespread adoption of E-exams. In today's digital era, there is a strong shift towards inclusion across every sector, utilising both digital technology and internet connectivity, along with physical modes, in the examination system. In advancing E-exams for persons with disabilities, schools and universities equipped with assistive

technology are essential. Particularly, persons with visual impairments mostly require assistive devices such as "screen reader" software for reading questions and answers, "magnification software" to enlarge screen-written documents, "recording audio devices" to listen to questions and answers, "talking calculators" to help them individually calculate numbers, and "headphones" to hear quietly. Similarly, students with hearing impairments require the use of a "sign language interpreter" to interpret sign language and understand others, "hearing aids" for low hearing, and a

writing/typing mode rather than an oral mode. Lastly, students with locomotor disabilities require “adaptive keyboards/ one-hand keyboards” to help them type independently, “keyguards” to prevent unintended keypresses, “joysticks” to move the cursor, and “speech-to-text software” to facilitate easy conversion from speaking to typing.

The Government of India formally introduced a provision to promote an inclusive examination system under the “Rights of the Persons with disabilities Act, 2016”. Under the Chapter III section 17(h) act of this provision states “to make suitable modification in the curriculum and examination system to meet the needs of students with disabilities such as extra time for completion of examination paper, facility of scribe or amanuensis, exemption from second and third language courses” (Legislative Department, 2016). Similarly, new guidelines are suggesting the examination bodies to promote independence—without the assistance of the scribe—in the competency written examinations and these guidelines have paved the path to “encourage students to take the examination independently, with the assistance of technology such as software—enabled laptops, desktops, braille/ large print, or by recording their answers. The examining bodies, to the extent shall make corresponding technology paraphernalia (i.e., software-enabled laptops/ desktops, braille/ large print, or recording devices) available in sufficient numbers with comprehensive coverage for Indian languages and English” (Department of Empowerment of Persons with Disabilities, 2025). These provisions and guidelines validate the importance of inclusion of e-exams for persons with disabilities.

Digital technology promotes a transformative teaching and learning environment, prompting questions about learning methods, content, instructional techniques, assessment

approaches, and platforms. Ministry of Human Resource Development (2020) section 24(3) addresses “Teachers require suitable training and development to be an effective online educator. It cannot be assumed that a good teacher in a traditional classroom will automatically be a good teacher in an online classroom.” Therefore, the teacher education system must incorporate technological strategies for skill development among student-teachers with disabilities. In online education, assessment is essential for understanding students’ grasp of the material. The implementation of the e-examination system aimed to assess students’ knowledge, intelligence, efficiency, and accuracy. This approach has established a modern and stable framework for accessing education at any time and has effectively removed physical barriers to communication during crises. Consequently, it has effectively addressed the significant challenges faced by the education sector during emergencies. One major hurdle in online education is conducting assessments and evaluations. Ministry of Human Resource Development (2020) also emphasised under section 24(3) “...numerous challenges to conducting online examination at scale, including limitations on question types, handling network and power disruptions, and preventing unethical practices.” Therefore, assessing the challenges and benefits of online exams is essential to identify what best suits the educational system, as determined by educators and policymakers.

Theoretical background of the study

“Technology Acceptance Model”, which examines how users interact with technology (Ma and Liu, 2004). This model is grounded in sociopsychological theory, which holds that when technology is easy to use, it simplifies tasks and encourages users to use it.

Conversely, if technology is difficult to use or perceived as unethical, it can lead to negative acceptance. Similarly, the transition from keypad mobiles to smartphones is due to the inclusion of many more suitable features. Therefore, we can conclude that if student-teachers with disabilities' attitude towards e-examinations is positive, ethically not the heart of the outcome of the examination, and students with disabilities don't experience any difficulties during the examination, then switching from paper-based exams to e-exams would be feasible.

Review Related Studies

Concerning the related review of the literature on students without disabilities regarding online examinations, the study's findings were contradictory. Montenegro-Rueda et al. (2021) reviewed multiple studies indicating that students' views on online exams varied. In addition, concerning the issue of cheating, e-exams increase transparency, help maintain security and prevent cheating (Ali et al., 2021; Hillier et al., 2020). In contrast, misconduct and dishonesty are significant issues during online exams (Montenegro-Rueda et al., 2021). Regarding the online exam performance, students reported that their experiences didn't affect their performance on e-exams (Keyamo et al., 2024). Conversely, Ali et al. (2021) found that students thought video tutorials on computer literacy and typing skills were helpful for online assessments. Concerning the issue of importance, some studies have suggested that relying solely on online exams as an assessment tool is unsuitable (Reedy et al., 2021; Hamsatu et al., 2016). In contrast, Al-Hakeem and Abdulrahman (2017) found that modern e-exams can eliminate past exam problems and provide a cost-effective solution. Research studies on students without disabilities related to e-exams are likely challenging to generalise to students with disabilities.

Concerning the related review of the literature on students with disabilities regarding online examinations, the studies' findings were contradictory. Concerning the home environment, Ilgaz and Adanir (2019) reported that students with disabilities were satisfied with online examinations in their home environment. However, Gin et al. (2021) explored that the home setting was unsuitable for testing due to noise issues mentioned by students with disabilities. Regarding the facilities, Priyanka Kulathilake and Sandeepani (2024) found that the facilities of the online examination were not satisfactory, as reported by teachers. In contrast, Abdulwaheed (2024) found that the online examination accessibility facilities were accessible and felt good, as reported by science students. Regarding the issue in remote areas, Aristeidou et al. (2023) reported that the disability and employment concerns of students from open universities in remote areas included positive perceptions regarding online education. However, Paramasivam et al. (2022) stated that students with disabilities in remote areas faced issues with network connectivity, financial difficulties, and developed frustration due to their inability to attend classes. Regarding the issue of open university PWD, Noguera et al. (2018) stated that most open university students with disabilities were pleased and relaxed with the assessment due to the institution's arrangement of proper security instruments and safe data. However, Matjila and Dhlomo-Sibiya (2024) noted that open university students experienced frustration and inconvenience due to the absence of a Scribe/interpreter, difficulties in assigning assistive devices promptly, the lack of hand-free software, and issues with time management. International research studies cannot be generalised to students with disabilities related to e-examination in the Indian context. Research from international studies

on students with disabilities and their attitudes toward online exams has been mixed and limited. The main reason for this is the variety of background factors at play. In India, the nature of society, geography, and area restrict the external validity of research studies. Additionally, there are very few international studies that address students with disabilities in higher education. Furthermore, students with disabilities significantly influence societal outcomes. Therefore, it is essential to examine the attitude factors of students with disabilities toward e-examinations within the Indian context.

Significance of the study

Communication during exams, whether in person or online, can create barriers for individuals with disabilities, leading to feelings of inferiority, frustration, and technological challenges (Kumari and Jain, 2014; Alcorn and Cheesman, 2022). In today's world, technological skills are vital for student-teachers with disabilities to adapt to ongoing advancements. The pandemic drove a shift to online learning, and in the modern era, India's education system has moved toward blended learning. Accessibility is key for students with disabilities to improve their skills. Evaluating their technical proficiency is necessary for effective use of available tools. Although online examination systems were introduced during the pandemic, much of academia has overlooked disability-related research on the e-exam issues (Bashiti Al Shaaer et al., 2021). Meeting inclusion goals without considering their viewpoint is difficult, especially since online exams were implemented without consent during COVID-19, and challenges faced during online testing remain unaddressed. Data collection for this vulnerable group is costly and time-consuming, often leading to neglect in

disability research. This study aims to explore this issue, focusing on student-teachers with disabilities' attitudes toward switching e-exams in teacher education. Their unique attitudes as both teachers and learners during the pandemic offer a valuable perception. These perspectives are vital for guiding educational reforms. The findings will help policymakers design a more accessible, obstacle-free examination system for student-teachers with disabilities.

Statement of the problem

Attitudes of student-teachers with disabilities toward switching to e-exams in teacher education.

Research Objectives

The study will examine the prime factors that frame the attitude of student-teachers with disabilities towards switching to e-exams in teacher education.

Research Question

What are the prime factors that frame the attitude of student-teachers with disabilities towards switching to e-exams in teacher education?

Definitions of the Term Used

Student-teachers with disabilities

Student-teachers with disabilities are those who have completed their practice teaching during a teacher education program and hold a government-certified certificate for persons with disabilities.

Attitudes

Attitudes refer to the personal feelings, beliefs, and behavioural perceptions of student-teachers with disabilities toward doing positive or negative actions.

E-exams

The E-exam license education system evaluates student-teachers with disabilities through online communication methods.

Teacher Education

Teacher education refers to a formal program that prepares student-teachers with disabilities to become effective teachers.

Methodology

Research method

In the proposed research study, the nature of the research problem employs a descriptive research method in conjunction with a quantitative approach to uncover empirical evidence regarding the factors associated with online examinations for student-teachers with disabilities.

Population of the study

In this research, the population consists of all student-teachers with disabilities who joined courses in the teacher education program during COVID-19 at

“Jagadguru Rambhadracharya Divyanga University”, Chitrakoot.

Sample and sampling technique of the study

132 student-teachers with disabilities were selected using a simple random sampling technique from Jagadguru Rambhadracharya Divyang State University, Chitrakoot, Uttar Pradesh, India. The research participants completed their B.Ed. course during COVID-19 from the Department of Education and the Department of Special Education. Three locations within the university, namely classrooms, hostels, and playgrounds/road areas; were identified where Student-Teachers were found engaged with each other. For sampling, the lottery method was used to select the location of these research participants. Places of participants from the hostels were finally decided when the lottery page was unfolded. The sample comprises participants from the girls’ hostel and the boys’ hostel. The drawing of the different sample categories is shown in Table 1. Formal consent was taken from them before responding to a questionnaire.

Table 1: Representation of sample categories

“Jagadguru Rambhadracharya Divyanga State University”				
Sl. No.	Different types of student-teachers with disabilities.	Male	Female	Total
1.	VI	27	10	37
2.	HI	6	8	14
3.	OH	38	43	81
Total		71	61	132

Data Collection

Specification and design process of the E-examination perception scale

This study used primary data to assess students with disabilities’ perceptions of E-exams. The perception level was

measured using the E-examination perception questionnaire, created by the researcher to gather opinions of student-teachers with disabilities. Initially, 28 items across three factors were developed. These items were then sent to experts for validity testing

using a 5-point rating scale. Only items rated above the average were kept. Additionally, 12 items were selected for further analysis. A pilot study with 20 student-teachers with disabilities was conducted to identify questions with low loadings, saving time and resources while addressing issues like unclear wording and redundancy; questions with loadings above 0.45 (Comrey and Lee, 2013) were retained. In the end, 12 items across three factors were chosen for data collection.

Statistical analysis

Firstly, multiple descriptive and inferential statistics were conducted to analyse the raw data. Regarding the normality assessment of the data, both the index of skewness and kurtosis, calculated with the standard error, and the Shapiro-Wilk test of normality were performed. The value of Cronbach’s Alpha reliability was .706, indicating an acceptable level of reliability for the data collection tool (Wells and Wollack, 2003). To meet the criteria for exploratory factor analysis (EFA), the “Kaiser-Meyer-Olkin Test of Sphericity” was used to verify sampling adequacy, and the “Bartlett’s Test of Sphericity” was employed to confirm intercorrelation among variables. Additionally, an “Index of Determinant” was calculated to show that multicollinearity was not a problem. All three cutoff criteria for exploratory factor analysis were met, and then EFA was conducted. Regarding confirmatory factor analysis (CFA), it was performed to validate the factors related to student-teachers with disabilities’ attitude toward e-exams. Several indices were examined to assess whether the model fit the data well. According to CFA standards, at least 3 to 5 latent variables should be identified as factors, as noted by Kline (2023). Multiple fit indices indicate that a model’s fitness indices confirm

its appropriateness (Harerimana and Mtshali, 2020). In this study, the model was likely well evaluated and showed a good fit based on standard criteria such as: χ^2 ($p > 0.05$); comparative fit index (CFI, >0.90); incremental fit index (IFI, >0.90); goodness-of-fit index (GFI, >0.90); root mean squared error of approximation (RMSEA, < 0.08); and PClose (PClose, > 0.05) (Browne and Cudeck, 1993; Meyers et al., 2006; Hu and Bentler, 1999). IBM SPSS Statistics 28.0.0.0 was used for EFA, and SPSS AMOS 28.0.0.0 was also used for CFA.

Table 2: Skewness and Kurtosis of E-exams of student-teachers with disabilities

	Statistic	Std. Error
Skewness	-.214	.211
Kurtosis	-.216	.419

As shown in Table 2, the calculated skewness value is -0.214. This skewness index falls within the negative range but is much closer to zero, indicating near symmetry. Additionally, the computed skewness is divided by its standard error value (0.211), which falls within the normal range of ± 1.96 on the normal probability curve. Similarly, the calculated kurtosis value is -0.216, which is closer to the kurtosis index value of 0.263. Although slightly deviated, the kurtosis value remains near its normal value. Furthermore, the kurtosis is divided by its standard error (0.419), which falls within the normal range of ± 1.96 . Beyond this Table 3, the Shapiro-Wilk Test was conducted to verify the normality of the dataset. The Shapiro-Wilk test yielded a value of 0.170, which is higher than 0.05, indicating the data is suitable for a normal distribution. Furthermore, the Q-Q plot in Figure 1 shows that the data distribution is approximately normal, as most points lie along the line. This confirms that the data follow a normal probability distribution and are suitable for exploratory factor analysis.

Table 3: Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Total2	.070	132	.195	.985	132	.170

a. Lilliefors Significance Correction

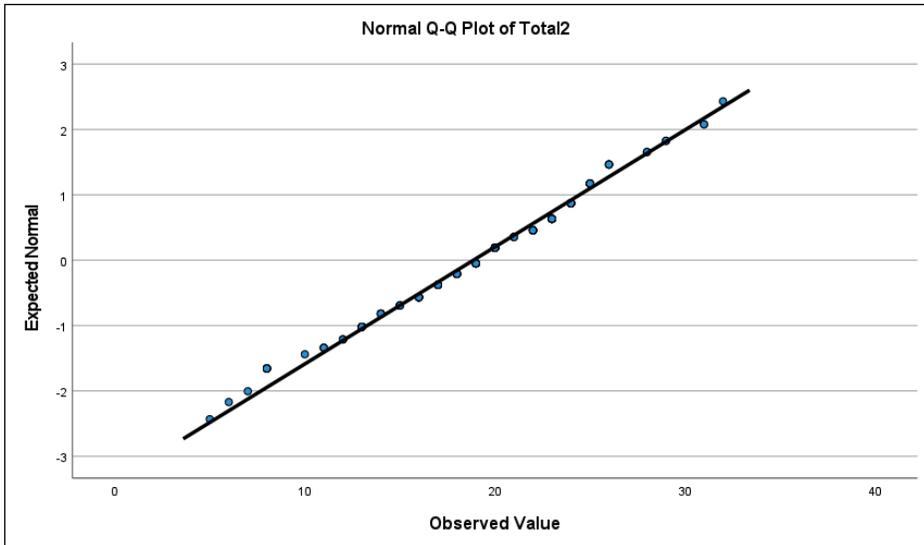


Fig. 1. Normal Q-Q Plot for normality shown

Concerning the “Kaiser-Meyer-Olkin” (KMO) test, indicates that there was no problem with adequate sampling. The calculated KMO test value was 0.724, which means the calculated test value is larger than the ideal value (0.7). Hence, it can be confirmed that sampling was free from any bias. Regarding “Bartlett’s Test of Sphericity”, to identify whether an interrelationship exists among the variables. The calculated “Bartlett’s Test of Sphericity” test value is 187.645, statistically significant at the 0.001 level. The hypothesis “there is no interrelationship found among the variables” is rejected, which means the alternative hypothesis “there is an interrelationship found among the variables” is accepted. Therefore, it can be confirmed that the assumptions of sampling adequacy and intercorrelation

among the variables are statistically fulfilled for further study of EFA.

Regarding the “Index of Determinant”, it was determined that no multicollinearity problem exists in the data set. The computed determinant value was .230, which was higher than the Normal Determinant value (0.00001). This indicates that the computed determinant value is sufficient to assert that there is no multicollinearity problem for further study of EFA.

Factor extraction

Regarding the criteria for factor extraction, only eigenvalues greater than 1 were considered (Kaiser, 1960). If these rules are followed, only a two-factor extraction is possible, as indicated in Table 4 and Figure 2, final resulting in

the removal of two items to meet the cut-off item loading criteria value 0.45 criteria (Comrey and Lee, 2013), and the other two questions were deleted for a minimum of 3 to 5 latent variables criteria explained in one factor (Kline, 2023). Two factors accounted for a total variance of 51.241% in this extraction.

Regarding the supportive document of eigenvalues shown in Figure 2, the X-axis represents the position of the factors, and the Y-axis represents the position of the eigenvalues. It is visible that more than 1 eigenvalue raises two factors.

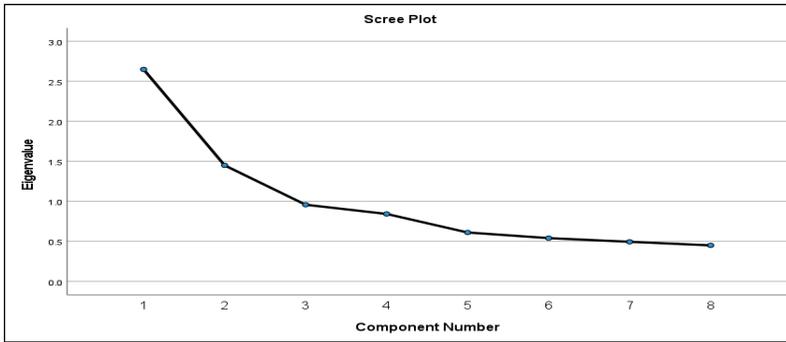


Fig. 2. Displaying a scree plot of the attitude of E-exams

Table 4: Displaying the total variance explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1.	2.649	33.113	33.113	2.167	27.093	27.093
2.	1.450	18.128	51.241	1.932	24.147	51.241
3.	.958	11.981	63.221			
4.	.843	10.540	73.762			
5.	.612	7.645	81.407			
6.	.541	6.767	88.173			
7.	.495	6.193	94.366			
8.	.451	5.634	100.000			

Extraction Method: Principal Component Analysis.

Table 5: Factors loading components of e-exams attitude in "Rotated Component Matrix"

	Component	
	1	2
Factor 1: Negative Personal Attitude		
Due to online exams, I am learning less.	.793	

	Component	
	1	2
I always face problems completing the online exam paper on time.	.773	
I want more time to complete the answer writing for the e-examination.	.715	
In an online home environment, it is very easy to cheat on exams.	.513	
Factor 2: Positive Personal Attitude		
I feel excited to complete the project work online.		.818
I enjoy collaborating with friends during e-exams.		.745
I am happy to solve all the questions in the E-exams compared to the offline paper-and-pencil test.		.631
I am excited about the learning load due to the online test.		.485
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.a		
a. Rotation converged in 3 iterations.		

Factor 1: Negative Personal Attitude

Regarding the "Rotation Component Matrix" in Table 5, it examines the first four variables among the interrelated set, which reflect negative personal attitudes toward learning less, completing tasks on time, the time needed for tasks, and the ease of cheating. These four variables are therefore labelled "negative personal attitudes." This factor accounts for 33.11% of the variance, which is significant compared to the others. These four interrelated variables represent it. The first variable, "Due to online exams, I am learning less," has the highest factor loading (0.793). The second, "always face problems completing the online exam paper on time," has the second-highest loading (0.773). The third, "I want more time to complete the answer writing for the e-examination," ranks third (0.715). The fourth, "In an online home environment, it is very easy to cheat on exams," has the lowest loading (.513). The range of factor loadings is from .793 to .513. The eigenvalue for this factor is 2.649, the

highest among all factors.

Factor 2: Positive Personal Attitude

The "Rotation Component Matrix" Table 5 shows evidence that it explored the last four intercorrelated variables, specifically a positive personal attitude towards project work, collaboration on preparation, solved questions, and learning load. Therefore, the second four variables explore a factor named "positive personal attitude." This factor explains 18.12% of the variance, which is lower than the first factor, but this variance value cannot be ignored. Of the four variables in this factor, the first variable, "I feel excited to complete the project work online," is the top performer with a factor loading of .818. The second variable, "I enjoy collaborating with friends in e-exams," ranks as the runner-up with a loading of .745. The third variable, "I am happy to solve all the questions in the E-exams compared to the offline paper-and-pen," holds third place with a loading of 0.631 in this factor. The fourth variable, "I am happy about the learning load due to

the online test," has the lowest loading of .485 among these factors. The range of factor loading from top to bottom performance spans from .818 to .485,

not only in this factor but also among the other factors. The eigenvalue of this factor is .485, which is the lowest value compared to the first factor.

Confirmatory Factor Analysis

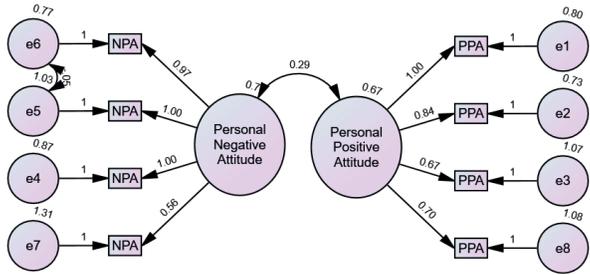


Fig. 3. CFA Model for the factors associated with the use of online examinations for student-teachers with disabilities (with unstandardised estimates). Names of factors: Factor 1 (personal negative attitude); Factor 2 (personal positive attitude).

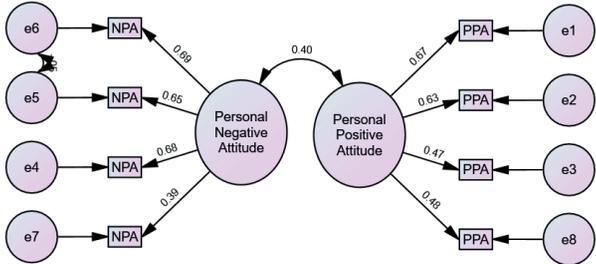


Fig. 4. CFA Model for the factors associated with the use of online examinations for student-teachers with disabilities (with standardized estimates). Chi-square of good fit ($X^2 = 30.883, df = 18, p = 0.030$); $GFI = .946 (> 0.900)$; $CFI = 0.922 (> 0.900)$; $IFI = 0.926 (> 0.900)$; $RMSEA = 0.074 (< 0.080)$; $PCLOSE = .175 (> 0.05)$.

Names of factors: Factor 1, personal negative attitude (PNA); Factor 2 personal positive attitude (PPA).

Table 6: Standard estimated values and levels

Factors		Items	Estimate	Levels
Factor 1	<---	PNA7	.625	Good
	<---	PNA10	.681	Good
	<---	PNA6	.685	Good
	<---	PNA1	.414	Educate
Factor 2	<---	PPA2	.481	Educate
	<---	PPA5	.674	Good
	<---	PPA4	.630	Good
	<---	PPA3	.470	Good

Table 7: Calculated CFA indices value and interpretation

Fit Index	Measurement Model	Recommended Value	Interpretation
CMIN	31.11		
DF	19		
CMIN/DF	1.716	≤ 2	Excellent fit (Kline, 2023)
RMSEA	.074	Between 0.05 to 0.08	Acceptable fit (Browne & Cudeck, 1993)
GFI	.946	Greater than .900	Good fit (Meyers et al., 2006)
CFI	.922	Greater than .900	Good fit (Meyers et al. 2006)
IFI	.926	Greater than .900	Good fit (Meyers et al. 2006)
PClose	.175	Greater than 0.05	Good fit (Hu and Bentler, 1999)

Cross-identification of the two factors related to the use of online examinations for student-teachers with disabilities involved CFA analysis (Harerimana and Mtshali, 2020). The standardised estimates ranged from good to adequate, 0.414 to 0.681 (Hernández-Ramos et al., 2014), and both factors correspond to four latent variables, indicating they meet 3-5 latent criteria (Kline, 2023). Figure 3 displays unstandardised estimates, while Figure 4 and Table 8 show standardised estimates for the CFA of these factors, aligning well with student-teachers with disabilities' attitudes toward e-exams.

The CFA model (Table 7) exhibits indices indicating a good fit. The absolute fit indices show a chi-square value of 31.11 with 19 degrees of freedom, and the quotient is below 2, signifying an excellent fit (Kline, 2023). The RMSEA value of 0.074 falls within the acceptable range of 0.05 to 0.08 (Browne and Cudeck, 1993). Additionally, the GFI value of 0.946 exceeds the threshold of ≥ 0.900 , indicating a good fit (Meyers et al., 2006). For incremental fit indices, the CFI value of 0.922 meets the criteria for a good fit (≥ 0.900), and it is commonly used to compare multiple fit coefficients (Hernández-Ramos et al., 2014). The IFI, which accounts for degrees of

freedom for improved efficiency, has a value of 0.926, also within the good fit range (≥ 0.900). These results affirm that "personal positive attitude" and "personal negative attitude" are strongly associated with student-teachers with disabilities' attitudes toward e-exams.

Results of the study

- The determinant, "Kaiser-Meyer-Olkin", "Bartlett's Test of Sphericity" test value fulfilled their required standard cut-off criteria, which provides clear evidence that further exploratory factor analysis is possible and no hurdle to the analyses.
- Perception of E-exam with student-teachers with disabilities involves two factors.
- Both factors were proposed with a sense of positive and negative feelings on personal attitudes. The name of the two factors is "negative personal attitude" and "positive personal attitude", which are associated with four variables.
- The 1st "negative personal attitude" factor accounts for a large variance of 33.11%, while the 2nd "positive personal attitude" factor shows the

lowest variance at 18.12%, which means the 1st factor revealed the largest attitude regarding e-exams and the 2nd factor revealed the second largest attitude regarding e-exams.

- This study explains a total of 51.24% of the variance, leaving some unexplored variance that needs further investigation. This study found that more than half of the student-teachers with disabilities perceive switching to e-exams in teacher education.
- The “positive personal attitude” carries both the highest and lowest loadings, which means both the highest and lowest reasons exist in the first factor. The highest loading is 0.818, and the lowest range is .485 for both factors.
- The determinant, “Chi-squared”, “RMSEA”, “GFI”, “CFI”, and “IFI” test value fulfilled good fitness required standard cut-off criteria, which provides clearly confirmed with evidence that the “personal negative attitude” and “personal positive attitude” are the main factors of student-teachers with disabilities’ attitude toward switching e-exams in teacher education.

Discussion

This research, using the factor analysis method, aims to explore and confirm the factors that shape the views of student-teachers with disabilities on e-exams. The findings reveal that two factors were primarily important for attitudes of student-teachers with disabilities about e-exams. In this study, the “Personal Negative Attitude” factor was explored as the most significant factor, having the second and third-highest loaded variables. The “Personal Positive Attitude” factor was explored as the second most significant factor,

having the highest and lowest loaded variables. These factors may arise from various internal and external reasons. The first factor, Personal Negative Attitudes, exhibited greater variance (33.113%), and it was covered by multiple causes, such as e-exams promoting less learning, poor time management, more time to answer writing, and a home environment that was easy for cheating. This finding, especially the cheating variable and more time to answer writing, was consistent with findings of Newton and Essex (2024), who analysed 19 studies and reported that cheating increased significantly during the COVID-19 pandemic, with 54.7% more incidents compared to the pre-COVID-19 period. Similarly, Noorbehbahani et al. (2022) reported that low teacher interest and weak pedagogical styles are major reasons for student engagement in unethical cheating during online assessments. In addition, some studies reported that limited time is a significant factor contributing to stress during online exams (Elsalem et al., 2020; Tam, 2022).

The second factor, Personal Positive Attitudes, displayed the second highest variance (18.128%), and it was covered by multiple remedies in e-exams, such as project work, collaborative work, solving the questions, and tackling learning loads, which were felt as excited, enjoyable, and happy by student-teachers with disabilities. Therefore, it is confirmed that introducing e-exams in the teacher education program during project work, collaborative work, solving the questions, and tackling learning loads helps to increase 18.128% of examination happiness. Previous research studies also indicate a similar view that collaborative e-exams increases social engagement and participative learning, as reported by Shen et al. (2007). Similarly, Chaibuth and Tantranont (2018) state that students were eager to learn through

assessment with the help of online collaboration. Beyond the similarities, students' perceptions of e-assessment were generally favourable and encouraged due to the immediate feedback provided in e-assessment, as reported by Alsadoon (2017).

The leading factor, "Personal Negative Attitude," is not associated with the theoretical model of "Technology Acceptance Model." But the second leading factor, "Personal Positive Attitude," is associated and establishes a significant link. Because the "Technology Acceptance Model" assumes that the user acceptance attitude increases when technology is user-friendly and productive. Therefore, both factors indicate "Technology Acceptance Model" where the e-exam evaluation process can or cannot be used.

Concerned about the reliability of the tool, Wells and Wollack, (2003) reported that the range of reliability coefficients was good and acceptable; this range of reliability data, covering all questions, was well consistent for data collection. The value of Cronbach's Alpha reliability was calculated as 0.706, indicating more than 70% consistency, a good and acceptable level of reliability for the data collection tool, while leaving unexplored variance that may be a calculation error.

On the norm of EFA variance power, the research study of Arun et al. (2023) found irregularities; they explored 41.075% of variance. In contrast, this study explains a total of 51.24% of the variance. Besides, regarding the confirmed model, this research study confirms the explored factors with the help of CFA calculation, whereas some studies are not associated (Aristeidou et al., 2024; Arun et al., 2023), because both studies only explored with the help of EFA not confirm their explored factors. Moreover, regarding the extracted factors, the study of Arun et al. (2023) is not associated, because

their study explored only one factor, while this research study explored and confirmed two factors.

Educational Implications

Only a guideline was proposed for comparative written exams, which is not a proper solution. The study findings propose that policymakers should transform the lab computers to assistive device-enabled computers with the help of allocations and make guidelines for particular e-exams for students with disabilities in higher education. Different departments in higher education encourage students with disabilities to become skilled in writing with the help of these computers. When they are skilled in using assistive device-enabled computers, then it is possible to take the examination independently. It encourages student with disabilities to take e-exams in project work, collaborative work, and then scale-up solving the questions.

Conclusion

This study investigated an applicable solution to the research question "What are the prime factors that frame the attitude of student-teachers with disabilities towards switching to e-exams in teacher education?". The primary data analysis reveals two main factors that influence the attitude of student-teachers with disabilities: "Personal Negative Attitude" and "Personal Positive Attitude," each linked to four variables. The "Personal Negative Attitude" factor was the primary attitude factor for student-teachers with disabilities. The most and the least significant variables fell under the category of "Personal Positive Attitude." At the same time, the second and the third highest loading variables were aligned with "Personal Negative Attitude." Moreover, variance analysis indicated that the "Personal Negative

Attitude" factor was primarily viewed as a barrier in taking online exams among student-teachers with disabilities.

The primary obstacle behind the "Personal Negative Attitude" of student-teachers with disabilities regarding e-exams was "due to online exams, I am learning less." Similarly, the second and the third obstacles were related to time management issues in e-exams: "I always face problems completing the online exam paper on time," and the third reason was "I want more time to complete the answer writing for the e-examination." The last primary reason behind "Personal Negative Attitude" was "online home environment, it is very easy to cheat on exams." Therefore, it is very much needed to work on these four challenges, and then 33.113% of e-exam-related negative attitude among student-teachers with disabilities can be solved.

The second most contributing factor, Personal Positive Attitude, was the most positive contributing factor for student-teachers with disabilities in e-exams. This was due to four reasons. The first reason behind "Personal Positive Attitude" was "I feel excited to complete the project work online." Similarly, the second reason was "I enjoy collaborating with friends during e-exams." In the same manner, the third reason was "I am happy to solve all the questions in the e-exams compared to the offline paper-and-pencil test." The last reason behind "Personal Positive Attitude" was "I am excited about the learning load due to the online test." Therefore, it is clear from the research finding that when examination conducting bodies promote e-exams, then the attitude of 18.128% of Student-teachers with disabilities regarding e-exams can be increased.

Reference

- Abdulwaheed, O. I. (2024). Perception of Science Education Students on the use of Electronics Examination (E-Exam) in Prince Abubakar Audu University (Paau), Anyigba. *Custech International Journal of Education*, 1(2), 77-94. file:///C:/Users/HP/Downloads/CV1N2-006.pdf
- Alcorn, S. R., & Cheesman, M. J. (2022). Technology-assisted viva voce exams: A novel approach aimed at addressing student anxiety and assessor burden in oral assessment. *Currents in Pharmacy Teaching and Learning*, 14(5), 664-670. doi.org/10.1016/j.cptl.2022.04.009
- Al-Hakeem, M. S., & Abdulrahman, M. S. (2017). Developing a new e-exam platform to enhance the university academic examinations: The case of Lebanese French University. *International Journal of Modern Education and Computer Science*, 9(5), 9.
- Ali, L., & Al Dmour, N. A. H. H. (2021). The shift to online assessment due to COVID-19: An empirical study of university students, behaviour and performance, in the region of UAE. *International Journal of Information and Education Technology*, 11(5), 220-228. doi.org/10.18178/ijiet.2021.11.5.1515
- Alsadoon, H. (2017). Students' Perceptions of E-Assessment at Saudi Electronic University. *Turkish Online Journal of Educational Technology-TOJET*, 16(1), 147-153. <https://files.eric.ed.gov/fulltext/EJ1124924.pdf>
- Aristeidou, M., Cross, S., Rossade, K. D., & Wood, C. (2023). ONLINE REMOTE EXAMS IN HIGHER EDUCATION: DISTANCE LEARNING STUDENTS'VIEWS. In *INTED2023 Proceedings*, (2556-2563). IATED. doi.org/10.21125/inted.2023.0715
- Aristeidou, M., Cross, S., Rossade, K. D., Wood, C., Rees, T., & Paci, P. (2024). Online exams in higher education: Exploring distance learning students' acceptance and satisfaction. *Journal of Computer Assisted Learning*, 40(1), 342-359.

- Arun, K., Gedik, N. K., Olcay, Z., Ozdemir, G., & Çıkrıkçı, M. (2023). A scale development to determine university students' attitudes to online exams assessment. *Advanced Education, 23*, 157-169.
- Bashitialshaer, R., Alhendawi, M., & Avery, H. (2021). Obstacles to applying electronic exams amidst the COVID-19 pandemic: An exploratory study in the Palestinian universities in Gaza. *Information, 12*(6), 256. doi.org/10.3390/info12060256
- Browne, M. W., Cudeck, R., Bollen, K. A., & Long, J. S. (1993). Alternative ways of assessing model fit. *Testing structural equation models, 154*(4), 136-162.
- Chaibuth, D., & Tantranont, N. (2018). Information Technology for Collaborative e-Learning: the Measurement and Evaluation of TQF's Learning Outcomes. *วารสาร มหาวิทยาลัยราชภัฏยะลา, 13*(1), 13-26. file:///C:/Users/HP/Downloads/admin_yru,+Journal+editor,+2.Dueanchai+Chaibuth%20(1).pdf
- Comrey, A. L., & Lee, H. B. (2013). *A first course in factor analysis*. Psychology press. https://doi.org/10.4324/9781315827506
- Department of Empowerment of Persons with Disabilities. (2025, August 1). *Revised comprehensive guidelines for conducting competitive written public examinations (linked to employment or admission to professional or technical courses) for persons with disabilities under the Rights of Persons with Disabilities Act, 2016, incorporating the Hon'ble Supreme Court directives (Office Memorandum No. F. No. P-13013/75/2023-Policy-DD-III)*. Ministry of Social Justice and Empowerment, Government of India. https://depwd.gov.in
- Elsalem, L., Al-Azzam, N., Jum'ah, A. A., Obeidat, N., Sindiani, A. M., & Kheirallah, K. A. (2020). Stress and behavioral changes with remote E-exams during the Covid-19 pandemic: A cross-sectional study among undergraduates of medical sciences. *Annals of Medicine and Surgery, 60*, 271-279. https://doi.org/10.1016/j.amsu.2020.10.058
- Gin, L. E., Guerrero, F. A., Brownell, S. E., & Cooper, K. M. (2021). COVID-19 and undergraduates with disabilities: Challenges resulting from the rapid transition to online course delivery for students with disabilities in undergraduate STEM at large-enrollment institutions. *CBE—Life Sciences Education, 20*(3), ar36. https://doi.org/10.1187/cbe.21-02-0028
- Hamsatu, P., Yusufu, G., & Mohammed, H. A. (2016). Teachers' Perceptions and Undergraduate Students' Experience in E-Exam in Higher Institution in Nigeria. *Journal of Education and Practice, 7*(23), 158-166.
- Harerimana, A., & Mtshali, N. G. (2020). Using exploratory and confirmatory factor analysis to understand the role of technology in nursing education. *Nurse Education Today, 92*, 104490. https://doi.org/10.1016/j.nedt.2020.104490
- Hernández-Ramos, J. P., Martínez-Abad, F., Peñalvo, F. J. G., García, M. E. H., & Rodríguez-Conde, M. J. (2014). Teachers' attitude regarding the use of ICT. A factor reliability and validity study. *Computers in Human Behavior, 31*, 509-516. https://doi.org/10.1016/j.chb.2013.04.039
- Hillier, M., Kumar, N., & Wijenayake, N. (2020, January). E-examinations: the impact of technology problems on student experience. In *Open Conference on Computers in Education* (pp. 35-45). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-59847-1_4
- Hu, L.T. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling: a Multidisciplinary Journal, 6*(1). https://doi.org/10.1080/10705519909540118
- Ilgaz, H., & Afacan Adanır, G. (2020). Providing online exams for online learners: Does it really matter for them?. *Education and Information Technologies, 25*(2), 1255-1269. https://doi.org/10.1007/s10639-019-10020-6

- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement*, 20(1), 141-151. doi.org/10.1177/001316446002000116
- Keyamo, C. A., Adebukola, O. S., & Baale, A. A. (2024). Secure Remote (Home) Electronic Examination Systems: Features, Challenges, and the Development of an Offline Model. *IJE*, 8(1), 25-37.
- Kline, R. B. (2023). *Principles and Practice of Structural Equation Modeling (5th)*. Guilford Press. <https://sampling.vitalsource.com/referral?term=9781462552016>
- Kumari, A., & Jain, J. (2014). Examination stress and anxiety: A study of college students. *Global Journal of Multidisciplinary Studies*, 4(1), 31-40. file:///C:/Users/HP/Downloads/PublicationinGJMDec2014-1.pdf
- Legislative Department. (2016) *The Rights of Persons With Disabilities Act, 2016*. Ministry of Law and Justice. https://iddashboard.legislative.gov.in/sites/default/files/A2016-49_1.pdf
- Ma, Q., & Liu, L. (2004). The technology acceptance model: A meta-analysis of empirical findings. *Journal of Organizational and End User Computing (JOEUC)*, 16(1), 59-72. <http://dx.doi.org/10.4018/978-1-59140-474-3.ch006>
- Matjila, T., & Dhomo-Sibiya, R. M. (2024). The Lived Experiences and Meaning of Being a Student with Physical Disabilities at an Open Distance Learning University. *UnisaRxiv*.
- Meyers, L. S., Gamst, G., & Guarino, A. J. (2006). *Applied Multivariate Research: Design and Interpretation*. SAGE.
- Ministry of Human Resource Development. (2020). *National Educational Policy 2020*. Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Montenegro-Rueda, M., Luque-de la Rosa, A., Sarasola Sánchez-Serrano, J. L., & Fernández-Newton, P. M., & Essex, K. (2024). How common is cheating in online exams and did it increase during the COVID-19 pandemic? A systematic review. *Journal of Academic Ethics*, 22(2), 323-343. <https://doi.org/10.1007/s10805-023-09485-5>
- Noguera, I., Guerrero-Roldán, A. E., Peytcheva-Forsyth, R., & Yovkova, B. (2018). Perceptions of students with special educational needs and disabilities towards the use of e-assessment in online and blended education: barrier or aid?. In *INTED2018 Proceedings. IATED*. <https://doi.org/10.21125/inted.2018.1157>
- Noorbebahani, F., Mohammadi, A., & Aminazadeh, M. (2022). A systematic review of research on cheating in online exams from 2010 to 2021. *Education and information technologies*, 27(6), 8413-8460. <https://doi.org/10.1007/s10639-022-10927-7>
- Priyanka Kulathilake, H. D., & Sandeepani, T. G. (2024). Exploring Digital Examinations in Sri Lanka: University Teachers' Perspective. <https://tinyurl.com/3a5e24ws>
- Priyanka Kulathilake, H. D., & Sandeepani, T. G. (2024). *Exploring Digital Examinations in Sri Lanka: University Teachers' Perspective* (Dissertation). <https://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-242716>
- Paramasivam, S., Krishnan, I. A., Amin, A. S., Kaliappen, N., Sidhu, R. S., & Anbalagan, H. (2022). Challenges faced by disabled students in online learning during the COVID-19 pandemic. *International Journal of Academic Research in Business and Social Sciences*, 12(1), 20982113. doi:10.6007/IJARBS/v12-i1/12282
- Reedy, A.K., Pfitzner, D., Rook, L., & Ellis, L. (2021). Responding to the COVID-19 emergency: student and academic staff perceptions of academic integrity in the transition to online exams at three Australian universities. *International Journal for Educational Integrity*, 17. <https://doi.org/10.1007/s40979-021-00075-9>

- Shen, J., Hiltz, S. R., & Bieber, M. (2007, July). Group collaboration and learning through online assessments: comparison of collaborative and participatory online exams. In *International Conference on Human-Computer Interaction* (pp. 332-340). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-73111-5_38
- Tam, A. C. F. (2022). Students' perceptions of and learning practices in online timed take-home examinations during Covid-19. *Assessment & Evaluation in Higher Education*, 47(3), 477-492. <https://doi.org/10.1080/02602938.2021.1928599>
- Wells, C. S., & Wollack, J. A. (2003). An instructor's guide to understanding test reliability. *Testing & Evaluation Services University of Wisconsin*. <https://testing.wisc.edu/Reliability.pdf>
- Wibowo, S., Grandhi, S., Chugh, R., & Sawir, E. (2016). A pilot study of an electronic exam system at an Australian university. *Journal of Educational Technology Systems*, 45(1), 5-33. <https://doi.org/10.1177/0047239516646746>
- Yu, T. (2014). *An exploratory factor analysis and reliability analysis of the student online learning readiness (SOLR) instrument* (Order No. 3702939). Available from ProQuest Dissertations & Theses Global; Publicly Available Content Database. (1683135618). <https://www.proquest.com/dissertations-theses/exploratory-factor-analysis-reliabilitystudent/docview/1683135618/se-2>