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Measuring the perceptions of prospective teachers: Planning technology-based learning during the Covid-19 pandemic

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ABSTRACT

Online learning planning presents unique challenges that aspiring teachers must prepare for. This study aims to identify potential teachers' perspectives on designing technology-based instruction. Competency dimensions were created based on the findings of focused group discussions (FGD) with teachers and lecturers, which resulted in aspects of social networking, managing digital identity, filtering, creating content, and reusing. Following the FGD, indicators of nine dimensions—pre-learning, opening planning, material mastery, learning models, learning resources, student involvement, assessment of processes and results, interaction mastery, and closing learning-were created. Samples were taken through simple random sampling of 250 prospective teachers in education study programs at Jenderal Soedirman University, Sebelas Maret University, IKIP PGRI Bojonegoro, PGRI University Yogyakarta, and Surabaya State University. From these competencies, construction testing through confirmatory factor analysis shows a chi-s Square of 1063.59 with df= 32 (required criteria for chi-s Square < 2df), p-value 0.000 (required criteria ≥ 0.05), even though the Root value of the Mean Square Error of Approximation (RMSEA) has met the required criteria of ≤ 0.08, namely 0.072. Testing on the measurement model generated 32 items and nine indicators of prospective teachers' perceptions of planning technology-based learning. The four competencies of pre-learning, planning to open learning, and closing learning have the highest scale of abilities attained. The learning resources and media created by future teachers have the lowest aptitude.

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INTRODUCTION

Coronavirus Disease-2019 or better known as covid-19 is a disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (Siahaan et al., 2021). A person exposed to Covid-19 is characterized by difficulty breathing, runny nose, sore throat, cough, and fever (Hui et al., 2020; Wu et al., 2020). Since being discovered in Wuhan, China, in December 2019, Covid-19 has rapidly spread throughout the world through direct contact (droplet and human-to-human transmission) and indirect contact (contaminated objects and airborne transmission) (Lotfi et al., 2020; Ouassou et al., 2001). The World Health Organization (WHO) responded to the Covid-19 virus's extremely rapid spread on December 31, 2019, by notifying the Chinese Health Authorities to stop the virus' spread by tightening surveillance and limiting public activities (World Health Organization, 2020). In line with the notification from WHO, all governments in the world are taking various policies that can minimize the spread of Covid-19 (Lee, 2020). Therefore, the presence of Covid-19 has had an impact on changing the form of community activities in order to pay attention to suppressing the spread of the virus.

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The restriction of activities outside the home, also known as a lock-down policy, for a period determined by the government of that country, is one of the changes in the nature of community activity in many countries (Alvarez et al., 2020). In line with this, one of the supports from the Indonesian government in suppressing the spread of Covid-19 is through implementing a distance learning policy through electronic media (Siahaan et al., 2021). Distance learning is a teaching and learning activity carried out in a different place using online and/or online-based applications and communication media (Zainudin & Utami, 2021). Thus, one of the policies of the Indonesian government is to stop the spread of Covid-19 by implementing distance learning using online and/or offline-dependent applications and communication media.

Online learning is education that takes place over a network of computers that is accessible, flexible, and allows for a range of different learning interactions. Along with supporting educational media, students must take an active part in the learning process in this network. Students really need the independence principle to complete the learning process in this network. Teacher competency as the ability to manage student learning includes teacher understanding of students, lesson plans, learning evaluation, and student development to actualize the various potentials they have (Giantara, 2019; Mumpuniarti et al., 2020; Wardoyo et al., 2020; Widyaningrum et al., 2019). Furthermore, Dea et al. (2021), Somantri (2021), and Akbar (2021) explained that one of the pedagogical competencies needed in managing the learning of 21st eternal generation students is the teacher's ability to utilize information technology in the learning system. It is in line with the research results (Destiana & Utami, 2017) that digital-based learning can facilitate students in learning and at the same time prepare students to have the skills needed in the world of work. The ability to manage student learning, which includes the teacher's understanding of students, lesson plans, learning evaluation, and student development to actualize the various potentials of students by utilizing information technology, is therefore a necessary component of pedagogical competence for teachers in the twenty-first century. According to Prihono et al. (2022), it is known that the factors that affect the quality of teachers in the digital era in Indonesia. These factors included: work motivation, the principal's leadership style, work discipline, work environment, work culture, and performance.

This acceleration of digital education transformation has occurred since the Covid-19 pandemic (Boonroungrut et al., 2022). This is in line with Alomyan (2021) who states that the demand for the use of information technology in managing student learning has been implemented in most educational institutions since the Covid-19 pandemic hit the world in 2020. Based on studies by Masitoh and Kurnia (2022), Sholihatun et al. (2020), Putro et al. (2020), and Hamid et al. (2020), digital-based distance learning is considered effective in maintaining the quality of learning and at the same time an effective effort to suppress Covid-19 cases in educational institutions. To organize effective learning in raising student potential under various circumstances, digitally based distance learning needs to be continually researched and developed.

Teachers must undoubtedly have a variety of strategies at their disposal when preparing for online learning to maximize student potential. Online learning is defined as interaction in conveying information, interaction between teachers and students, and the development of attitudes, knowledge, and skills that are built constructively, among other features. Space and time efficiency are undoubtedly benefits of online learning. Using groups on social media sites like WhatsApp (WA), Telegram, Instagram, the Zoom application, Google Meet, or other learning resources, teachers can teach at the same time. Additionally, the government has made numerous online learning resources available, including internet quotas, schoolology, and 24/7 access to learning at a variety of educational vendors and start-ups. Thus, the teacher should be able to ensure students take part in learning at the same time even though in different places. Various facilities provided by the government are expected to facilitate teachers in planning the best learning. Learning planning aims to ensure that the implementation of teaching runs more smoothly and the results are better, meaning (1) the planned competencies, objectives and indicators can be achieved optimally; (2) the learning steps can be referred to by the teacher as a

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teaching guide; and (3) learning procedures are designed as concretely as possible so that they can be implemented properly. Of all the learning devices designed by teachers, these three aspects are determining factors that can make learning successful but also vice versa.

Digital literacy is one of the skills that will become ingrained after online learning, in accordance with the learning objectives. The digital literacy skills that are taught in class are good learning habits that have been adopted by schools, teachers, and students. In this pandemic, information and communication technology literacy is crucial to online learning. The fundamental skills required for using computers and browsing the internet are competency and literacy. The age and generation of technology users have an impact on ICT literacy; younger generations find it simpler to use technology than older generations do. Therefore, studying the perceptions of prospective teachers in planning online learning is very urgent. Prospective teachers are required to have abilities in all matters relating to planning, implementation, educational assessment and teaching. Digital literacy continues to be increasingly needed in line with teachers' abilities which must continue to improve. Various factors that contribute to the best possible learning must be considered when designing the use of information and communication technology in online learning. Relationships with users, in this case, potential teachers, and learning designs that can be improved upon must be considered when using information and communication technology. The ability to think critically by implicitly challenging, analyzing, and evaluating the information and then designing, creating, and making learning plans in learning approaches and media/platforms is a dimension of prospective teachers' learning ability in recognizing and comparing information at a higher level, comprehensive or unique instructional strategies.

RESEARCH METHOD

This quantitative study concerns on measuring how prospective teachers perceive technology-based learning when it comes to lesson planning. The research steps were completed by (1) creating the test, (2) estimating its validity and reliability, (3) gathering research data, and (4) analyzing the measurement results. Samples were taken by simple random sampling of 250 prospective teachers in education study programs at Jenderal Soedirman University, Sebelas Maret University, IKIP PGRI Bojonegoro, PGRI University Yogyakarta, and Surabaya State University. At various universities in Central Java, the Special Region of Yogyakarta, and East Java, the samples were aspiring teachers. According to the Slovin formula, the sample size for this study was 250 prospective teachers. KMO (Kaiser-Meyer-Olkin) analysis was performed after the data has been gathered as a test to determine whether the factor analysis that will be performed is appropriate. Factor analysis is possible because the KMO test scale is greater than 0.5 and stands at 0.83. The data construct validity was examined using confirmatory factor analysis, while validity testing of the content analysis coefficients from Aiken (1985) produced a coefficient of 0.92, higher than the minimum required value of the V index in the Aiken table. To interpret trends in perceptions of technology-based learning planning, data analysis techniques were employed.

FINDINGS AND DISCUSSION

Findings

Requirements Analysis and Test Construction

To conduct instruction that can explore students' learning talents and interests, teachers must develop their own competence. Due to Covid-19, the state of educational development is currently unstable and changing constantly, making mastery of information technology essential to achieving this goal. The best learning environments combine teaching and learning activities focused on competency mastery with digital literacy, referring to student comprehension, teach-

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er delivery of material, media use, and efficient learning resources. An effective learning syntax is also based on a lesson plan that applies the use of an interactive learning platform but still maintains students' psychological and affective conditions. Every learning component conventionally given to students is modified into a digital form that can facilitate access and interaction.

Table 1. Results of Data Construction from Interviews and FGDs

Competency Aspect	Learning Media	Learning Procedure
Social Networking	The teacher's ability to collaborate with the school's subject teacher team, MGMP, and the deputy principal for the curriculum to develop learning tools can be realized through various platforms to find needs and potential that need to continue to be developed in the classroom.	Provide space for movement in the form of interaction between students to make it easier for them to find solutions to problems in learning. Skillful in utilizing the breakout feature to build trust in networking so that the attitudes students show can be measured accurately. Social networking arises from the need for students to answer the problems given by the teacher.
Managing Digital Identity	Teachers can collaborate in assignments and manage subjects as a unified identity that students need to master so they are not involved in administrative processes. Each subject has characteristics, but grouping subjects can become a digital identity that can be collaborated through good learning management.	Teachers need to manage the class to be accessible to students with limited access. Learning mobility shows that teacher's ability to design learning is very well organized so no information is left behind because of students' different conditions. Trust in digital information can be managed properly if the teacher has designed the material through the transparent media development. Through modified learning regulations, technology acceptance, and digital transformation initiatives: teachers have succeeded in managing digital identities in the classrooms.
Filtering	The filter process is applied so the learning tools made by the teacher do not overlap and become an excessive burden for students. The component of mastering digital learning tools needs to be accompanied by filtering capabilities, so students do not have to master all the material. Material filters can also be used to determine the material urgency based on learning needs ranging from simple to complex and vice versa.	The learning process can be filtered digitally: prioritizing important information in the form of exploration, elaboration, and confirmation. Learning opportunities for students are increasingly open accompanied by stimuli provided by teachers in a form that is concrete, easy to understand, easy to access and has the most urgent interests to be resolved in class and outside of class.
Creating Content	Collaboration spaces provide opportunities for teachers to take advantage of various digital resources to maximize learning content so that it is more synchronized on the same learning platform. In addition, digitizing learning tools allows teachers to tighten attitude assessment through monitoring learning resources used by students both in assignments and performance.	Students receive a wealth of learning resources from various platforms throughout the learning process. When learning, they use resources accessible by teachers or other students in the form of material construction. For teachers and students, developing materials for lessons, presentations, assignments, and other purposes is a possibility that can be facilitated from various sources and across multiple platforms. The material suitability can be corrected together to answer various problem formulations comprehensively by joint study.
Reusing	Using workspaces on the same platform can provide an idea of the media that can be continued to use for not wasting time. Digital-based learning tools certainly make it easier for teachers and students to upload various learning needs at flexible times.	While learning, students can use the same model/strategy/approach to be simulated with different goals. The digital learning process forms have a good track record so they can be reused as a stimulus for other subjects or sub-chapters of study. Students' potential can be increased by developing and modifying learning models.

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The need to develop instruments to measure prospective teachers' abilities in planning IT-based learning is based on the educational transformation experienced by Indonesia. Learning planning is the main basis that prospective teachers need to prepare in achieving educational competency. In learning planning, prospective teachers are expected to have competence in (1) designing learning indicators in line with the competencies to be measured; (2) formulating indicators into concrete and measurable learning objectives; (3) planning contextual learning resources so each learning process can be achieved through good big picture planning; (4) visualizing the learning process in the form of systematic procedures; and (5) planning the measurement of each attitude, skill, and measurement to ensure that each previously designed indicator can be achieved.

Learning planning measurement tools are created based on the requirements of educators and the outcomes of discussions between education lecturers and teachers of various subjects. The ability of potential teachers to create instructional materials and information technology-based learning procedures has been identified as the latent dimension based on the FGD results. The results of data collection from expert interviews and FGDs to investigate the need for information technology-based learning planning are summarized in Table 1.

In order to develop analysis factors for learning planning skills, interviews and focus group discussions (FGDs) with teachers and education lecturers were conducted (see Table 2). A prospective teacher is expected to be professionally able to describe teaching plans to achieve indicators through a systematic learning process that is constructive but still student-oriented. The ability to plan learning based on information technology does not just support pedagogical competence. In the era of digital learning, it is crucial for teachers to create IT-based learning to accomplish beneficial learning objectives.

The scale instruments designed for the tests aim to evaluate the potential teachers' capacity for creating lesson plans. In order to reduce bias, language validation is performed after test construction to ensure that the final instrument does not contain words with multiple meanings or words that are ambiguous, redundant, or non-concrete and difficult for potential teachers to understand.

Table 2. FGD Results based on Parties Involved

Involved Parties	Input Device	Enter Learning Procedures
Lecturer	With openness of information, learning tools can be designed more comprehensively: it can involve students. Teachers are more critical in determining learning device development techniques and arranged more systematically so that students can access them. Digital literacy provides a challenge for teachers to develop digital learning tools.	Involve students in using learning platforms: in addition to making, it easier for teachers to determine learning models it will also streamline student learning time at home or during hybrids. Teacher sensitivity in planning learning must be designed based on student needs to increase digital literacy which will continue to be developed.
Teacher	Teachers are already busy with various administrative tasks at school. In addition, teachers need to have a private space for activities outside of learning at school so that synchronized learning tools can help teachers manage their time so they can run optimally.	Teachers often use the same model during online learning. The same strategy that is used repeatedly can be repeated as long as students are not bored and can be modified in the learning tool. Therefore, every procedure created can continue to be developed by looking at the potential in one asynchronous class.
Practitioner	Learning digitally with highly effective information technology is a new facility for teachers who want to develop. Qualified prospective teachers can adapt quickly to create well-documented learning tools.	Teachers can flexibly make learning devices according to time and place. The learning model used by the teacher can easily adapt according to student learning needs.

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One of the bases employed for determining the test construction is the FDG results. Important findings from discussions with educators are validated through theory and method triangulation based on the complexity of the results of the needs analysis conducted. Based on the results of the formulation of the discussed learning constructs, this research develops nine measurable dimensions including (1) pre-learning; (2) teacher planning in opening learning; (3) teacher competence in mastering the material; (4) learning approaches and strategies used; (5) learning resources and media; (6) student involvement; (7) process and outcome assessment; (8) language mastery; and (9) closing the learning process. Education students as prospective teachers are certainly able to reflect on plans that are designed to be able to better fulfill teaching competencies in the digital age.

Validity Testing and Reliability Estimation

The Aiken index was employed as content validation during validity testing before the test instrument was used on a large-scale research project. The more the scale items reflect the domain or overall concept being measured, the greater the content validity, which ensures that the measure includes an adequate and representative set of items that reveal the concept being interpreted. Validation cards are utilized in this study to gather information from raters. The suitability of the indicator functioning rating with the items assessed by Aiken in the range of 1-4 is one of several things that the rater needs to pay attention to. After the rater gives an assessment of the items, the activity is continued with a structured discussion with each rater in pairs to find agreement between raters. For example, use the Aiken validation card in instrument item number 9 as presented in Table 3.

Table 3. Example of an Aiken Validation Card

9	
Instrument Items	
I integrate scientific work into the learning that I plan through various forms of interaction processes that are packaged in various interactive-communicative media and still carry out the use of multimedia	
To what extent do the items above match the grid and indicators presented? Give an assessment by putting a tick (√) in the score boxes 1, 2, 3, and 4!	**Learning Grid:** Planning Information Technology-Based Learning **Indicator:** Mastery of learning sources and media
Very suitable (4) ✔ Suitable (3) Less suitable (2) Not suitable (1)	
Please tick (√) in the box below! If the items match the grid and indicators presented (score 3-4), then give the response "Yes". If the items do not match the grid and indicators presented by the score (score 1-2), then give the response "No" and the suggestions below.	**Improvement suggestions:** There is a very good fit between the grid and the indicators that are derived from the instrument items.

The data card in Table 3 demonstrates that qualitative raters can provide input even though the data is calculated quantitatively. The Aiken validation card was adapted from the validation data card (Astrini & Kumaidi, 2016, p. 430) which was changed according to language needs and adjustments. After all data cards are filled in, the Aiken index score is tabulated for analysis of the Aiken validation score according to Table 4.

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Table 4. Aiken's V Index Items Measuring Prospective Teachers' Perceptions in Planning Technology-Based Learning

No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
∑s	25	25	26	25	24	26	23	25	26	24	26	26	25	25	25	25
V	0.9	0.9	0.9	0.9	0.9	1	0.9	0.9	1	0.9	1	1	0.9	0.9	0.9	0.9

No.	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
∑s	25	25	27	24	26	25	25	25	25	25	26	25	25	26	26	26
V	0.9	0.9	1	0.9	1	0.9	0.9	0.9	0.9	0.9	1	0.9	0.9	1	1	1

The 32 items of the instrument tested on the nine experts were determined to be on the scale above the table based on the distribution of the validity testing index with the Aiken 5 criteria. On the nineteenth instrument item, the lowest threshold value is 0.89 and the highest value is 1.00.

By gathering data for construct validity, which examines the test's nine dimensions across its 32 items, validity testing is conducted based on the Aiken index. To demonstrate that the developed construct could be empirically confirmed, the scoring results of each respondent were examined. Confirmatory Factor Analysis (CFA) is the analysis employed, and Lisrel 8.50 software is employed. The analysis begins with checking the adequacy of the sample. Analysis of sample adequacy using the results of the KMO and Bartlett tests with the help of SPSS version 21. The results of the sample adequacy test are shown in Table 5.

Table 5. Sample Adequacy Test Results

Kaiseer-Meyer-Olkin Measure of Sampling Adequacy		0.976
Bartlett's test of sphericity	Approx Chi-Square	8703.172
	df	496
	Significance	0

Based on Table 5, the Chi-Square value on the Bartlet test is 8703.172 with a degree of freedom of 496, a p value <0.5 and a KMO value of 0.976. According to Hair et al. (2010), a group of data is said to meet the assumption of sample adequacy if the KMO value is >0.5. This means that the sample size of 260 used in instrument testing is sufficient. Therefore, the analysis can be continued, namely testing the suitability of the measurement model.

Factor analysis with two-level or second-order latent variables is the model applied. The analysis of the teacher candidate's perception measurement model, which was utilized to plan technology-based learning, generated results that indicated a fit model. This is illustrated by the chi-s square of 1063.59 with df = 32 (required criteria chi-s Square < 2df), p-value 0.000 (required criteria ≥ 0.05), even though the Root Mean Square Error of Approximation (RMSEA) value) has met the required criteria ≤ 0.08, which is equal to 0.072. Figure 1 shows the results of the analysis of the Teacher Candidate Perception measurement model in planning technology-based learning during the Covid-19 pandemic.

The next step is to analyze the model using other outputs since it does not satisfy the model fit criteria. The measurement model created is the foundation for the analysis performed. The analysis was completed by examining the Lisrel output with the suggested model changes. By releasing the parameters in the form of measurement error correlation between the items that have the highest increase in chi-square value, model modification is performed. By joining the error variance (positive new estimates) or dividing the error covariance (negative new estimates) that is demonstrated to be related, modification indices are constructed. This method is only to increase goodness-of-fit, not change the significance of the coefficient. Error variance that can be attributed or error covariance that can be separated only from the same construct (Hermida, 2009). The liberation is carried out in stages for the six pairs of observed variables.

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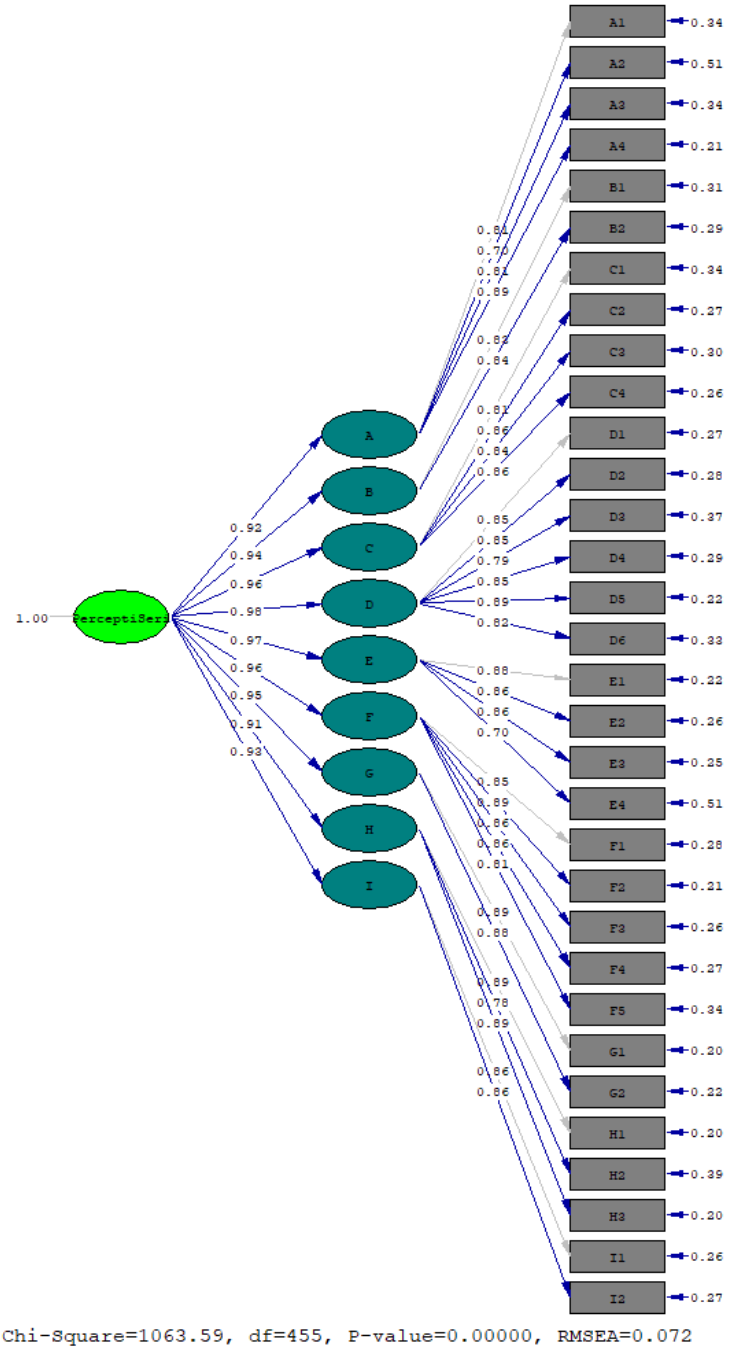

Figure 1. Path Diagram of the Second Order CFA Before Modification

After modifications were made based on the modification index, until there were no more modification indexes, it was suggested that there was a decrease in the chi-Square value to 491.59 with a df of 453. Changes also occurred in other model fit indices, namely the RMSEA of 0.026 and a p-value of 0. 10214. The measurement model based on the results of the analysis is presented in Figure 2.

The results of tests conducted on the measurement model produced nine indicators of prospective teacher perceptions in planning technology-based learning and 32 questions which produced a Root Mean Square Error of Approximation (RMSEA) value of 0.026 (≤ 0.08), chi-s Square of 491.59 (< 2df), p-value 0.10214 (≥ 0.05). Based on the criteria of the goodness of fit (GoF) index, all three have met the model suitability criteria, because they have met the required criteria.

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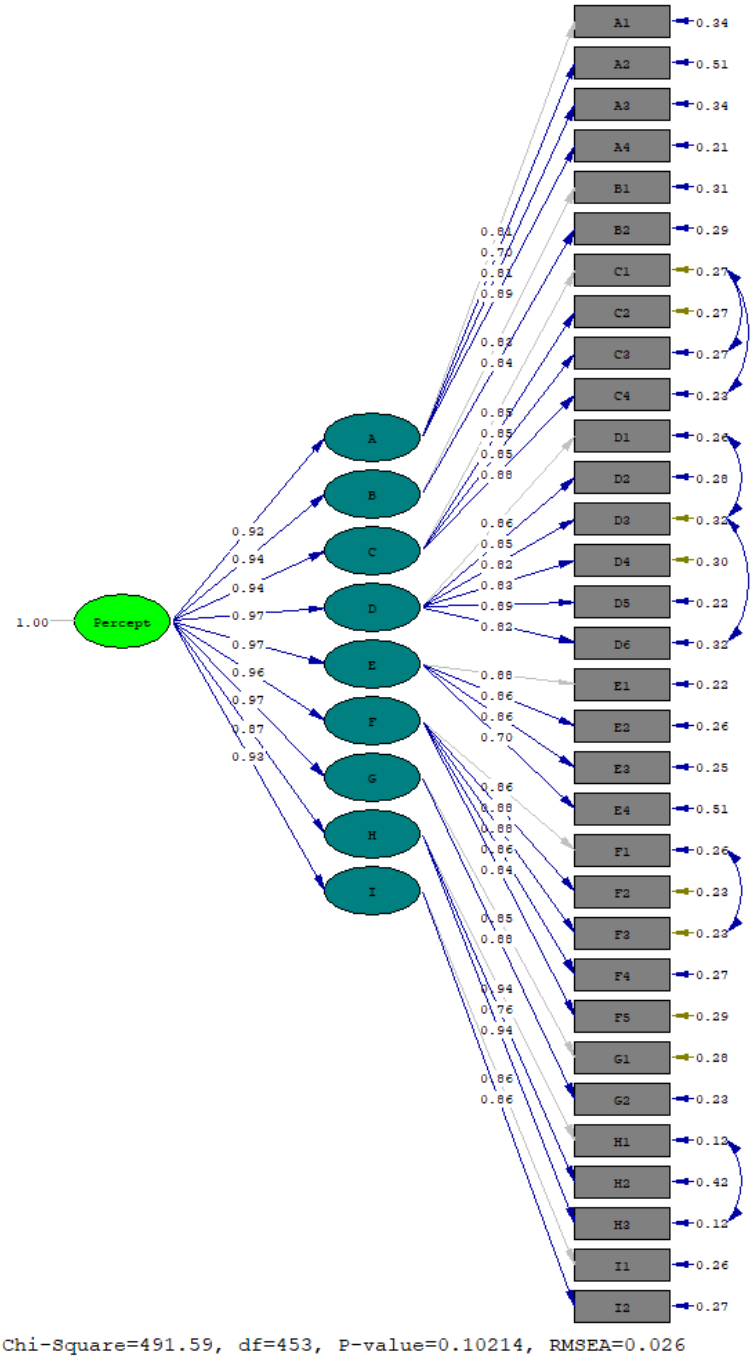

Figure 2. Path Diagram of the Second Order CFA After Modification

Table 6. Fit Model Assessment Based on the Goodness of Fit Index

GoF Size	Criteria	Estimation	Decision
Chi-square	< 2df	491.59 (2df = 906)	Fit
Significance (p-value)	≥ 0.05	0.10214	Fit
RMSEA	≤ 0.08	0.026	Fit
Goodness of Fit Index (GFI)	≥ 0.90	0.97	Fit
Adjusted Goodness of Fit Index (AGFI)	≥ 0.90	0.93	Fit
Normed Fit Index (NFI)	≥ 0.90	0.93	Fit
Comparative Fit Index (CFI)	≥ 0.95	0.97	Fit
Incremental Fit Index (IFI)	≥ 0.95	0.97	Fit

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Apart from using model fit indices in the form of RMSEA, chi-s Square, and p-value, researchers also looked at model suitability based on the results of analysis of other fit indices. The value of the match index used is presented in Table 6.

Table 6 demonstrates that each of the eight model suitability criteria used has been satisfied. It indicates that data are utilized to support the measurement model that was created. As a result, it can be determined that the measurement model for the instrument measuring aspiring teachers' perceptions of technology-based learning planning as a whole exhibits good suitability.

The results of tests conducted on the measurement model produced nine indicators of prospective teachers' perceptions in planning technology-based learning and 32 items. The nine indicators of prospective teachers' perceptions in planning technology-based learning are: pre-learning, opening learning, mastery of learning materials, learning approaches and strategies, use of learning resources/learning media, learning that triggers and maintains student involvement, assessment of learning processes and outcomes, use of language, closing. Pre-learning indicators are measured using four items, opening learning indicators are measured using two items, mastery of learning material is measured using four items, learning approaches and strategies are measured using six items, utilization of learning resources/learning media is measured using four items, learning triggering and maintaining student involvement is measured using five items, assessment of learning processes and outcomes is measured using two items, language use is measured using three items, closing is measured using two items.

After the measurement model developed empirically is declared to have a good fit based on the data, the next step is to prove the validity of the construct. Proof is carried out using the Standardized Loading Factor (SLF) measure. Loading factor is a coefficient that shows the close relationship between latent variables and manifest variables. According to Kline (2014), a loading factor of 0.3 is a reasonable criterion to indicate a prominent loading for a sample of at least 100. The results of the analysis are presented in Table 7.

Table 7. t-value, Standardized Loading Factor, and Validity

Latent Variable	Indicators/Items	t-value	SLF	Decision
Perspective	Pre-learning	10.10	0.92	Valid
	Planning opens	10.59	0.94	Valid
	Material Mastery	11.17	0.94	Valid
	Learning model	11.74	0.97	Valid
	Learning Resources and Media	12.17	0.97	Valid
	Student engagement	11.56	0.96	Valid
	Process and outcome assessment	11.33	0.97	Valid
	Interaction Mastery	11.46	0.87	Valid
	Closing Learning	10.97	0.93	Valid

The results of the Second Order CFA analysis in terms of the t-value and estimated SLF value presented in Table 7 show that of the thirty-two items analyzed, all of them had a t-value >1.96 (or visually none were red) and had the SLF value is greater than the critical limit (>0.3). This means that the thirty-two items significantly reflect the construct or latent variables and have good validity evidence.

In addition to validity, reliability is also an indicator of whether an instrument is said to be good or not. Based on the factor loading coefficient and unique error index for each item, the reliability coefficient of the measurement model developed can be estimated. Reliability is a coefficient that shows the level of consistency of the measurement result score. The reliability of a construct is estimated using Formula (1) according to Retnawati (2015), where CR = Construct Reliability, λ = Standardize Loading factor, and δ = Error for every indicator. Meanwhile, the results of the calculation of the Construct Reliability instrument for measuring the perceptions of prospective teachers in planning technology-based learning are presented in Table 8.

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$$CR = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)^2} i = 1, 2, 3 \ldots \ldots n \quad (1)$$

Table 8. Construct Reliability Instrument

Latent Variable	Indicators/ Items	SLF (λ)	$(\sum \lambda)^2$	Error (δ)	$(\sum \delta)^2$	Construct Reliability	Reliability index
Pre-learning	A1	0.81	733.8681	0.34	75.1689	0.907088	High
	A2	0.70		0.51			
	A3	0.81		0.34			
	A4	0.89		0.21			
Planning opens	B1	0.83		0.31			
	B2	0.84		0.29			
Material Mastery	C1	0.85		0.27			
	C2	0.85		0.22			
	C3	0.85		0.27			
	C4	0.88		0.22			
Learning model	D1	0.86		0.26			
	D2	0.85		0.27			
	D3	0.82		0.33			
	D4	0.83		0.30			
	D5	0.89		0.22			
	D6	0.82		0.32			
Learning resources and media	E1	0.88		0.22			
	E2	0.86		0.26			
	E3	0.86		0.25			
	E4	0.70		0.51			
Student engagement	F1	0.86		0.26			
	F2	0.88		0.22			
	F3	0.88		0.22			
	F4	0.86		0.27			
	F5	0.84		0.29			
Process and outcome assessment	G1	0.85		0.28			
	G2	0.88		0.32			
Interaction Mastery	H1	0.94		0.12			
	H2	0.76		0.12			
	H3	0.94		0.12			
Closing Learning	I1	0.86		0.26			
	I2	0.86		0.27			

Looking at Table 8 which presents the results of calculating the estimated construct reliability coefficient based on the loading factor coefficient and the unique error index for each item, it appears that the instrument has high reliability. This is indicated by the reliability coefficient which is in the score interval 0.8-1.00 (Istiyono, 2018). The reliability coefficient is inversely proportional to the error in measurement. The higher the reliability coefficient, the smaller the measurement error made to obtain the measurement result score. The smaller the reliability of the measurement result score, the greater the error that occurs.

Capability Measurement

Online learning is completed without being present in the same room and in person. Meeting young people in person or virtually can be done synchronously or asynchronously during online learning. In non-face-to-face learning, students are given time to study as much as they need to in the time, they have available. Teachers can benefit from various government

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platforms as well as those that they use personally. Various platforms are utilized to simultaneously distribute all types of educational materials in accordance with the demands of teachers and students (Sudaryanto, Saddhono, et al., 2020). Teachers can use direct or indirect communication to maximize the learning process to achieve the expected learning indicators. Flexibility as one of the characteristics of online learning needs to be emphasized by emphasizing effective learning tools so the learning procedures prepared by the teacher can be carried out according to the required learning stage, the teacher's space for movement in learning is freer but remains in the corridor of the lesson plans prepared and agreed upon by school curriculum team.

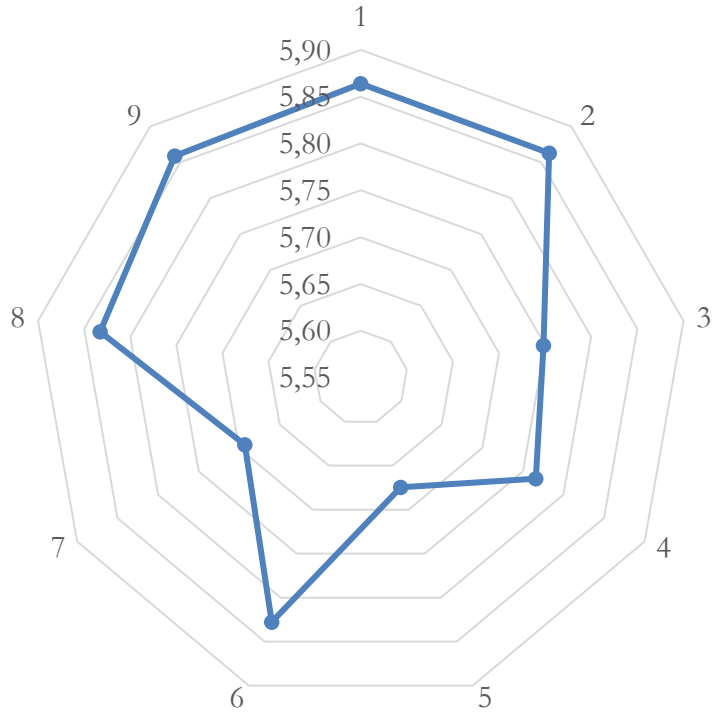

Figure 3. Map of Student Competences in Planning Learning

The evaluation of prospective teachers' capacity to design multimedia-based assessments, digital language and interaction, pre-learning activities, opening and closing digital-based learning, mastery of digital materials, online learning strategies, learning resources, student engagement, and learning closure. A self-representation of the capacity to create online learning based on information technology was measured. Measurements were utilized to demonstrate the accomplishment of each indicator's ability to react to quantifiable items related to online learning planning. By examining the degree of difficulty of the item items, ability measurement is used to determine the item items that make up the overall test.

Figure 3 shows a map of student competencies in planning technology and information-based learning. Student representation in accommodating information technology is shown on a scale of 1-7 with very irrelevant criteria up to very relevant categories. Based on the competency map, mastery of planning has the highest scale in the dimensions of learning planning, planning to open learning, and the ability to close learning. The weakest scale of the map of students' abilities in planning learning is in the dimensions of learning resources and media on an ability scale of 5.67 (see Table 9). The ability of prospective teachers to plan digital learning resources and multimedia-based learning media is an important factor in online learning. The importance of developing media and learning resources needs to be increased because data based on measurement results is still lacking.

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Table 9. Ability Scale of Prospective Teachers to Plan Digital Learning

Code	Dimension	Ability Scale
1	Pre-learning	5.86
2	Planning opens	5.86
3	Material Mastery	5.75
4	Learning model	5.77
5	Learning Resources and Media	5.67
6	Student engagement	5.83
7	Process and outcome assessment	5.69
8	Interaction Mastery	5.83
9	Closing Learning	5.86

Online learning that is designed to maximize student engagement, retention, and achievement of effective indicators. According to the findings of interviews with educators, practitioners, and practitioners, designing learning materials for distance learners or designing online learning is a potential step to ensure the success of the entire learning series. Because of the features of the learning environment, the audience in teacher-designed virtual classrooms consists of students who are easy to identify, but most students are closed and difficult to measure. To more effectively design lesson plans that meet students' needs, teachers must be aware of the learning styles, aptitudes, and weaknesses of their students. In the pre-learning section, defining learning in the form of clear objectives is very important to keep teachers and students focused throughout the lesson plan. Goals should be emphasized to students at the start to help them stay on track. Lesson objectives are focused on what students will be able to achieve at the end of the lesson. For example, the goal of learning is to help students learn a new skill or learn about a new concept.

Discussion

Ability to streamline designed learning by substituting teacher-made videos for written instructions. The teacher can make a brief video that explains various aspects of the pre-learning that the teacher must prepare instead of emailing them a document that explains something. Teachers can provide guidance and highlight key ideas for students to remember in videos by adding captions and transcriptions (which will be helpful for students with hearing disabilities). To create new videos or find relevant ones that are already online and maximize their potential in other ways, time effectiveness is used. Competence in maximizing learning resources and instructional media needs to be continuously cultivated so that they continue to be interesting. On the other hand, one of the learning resources that needs to be developed is making presentations as a visual tool that is conventionally considered the most effective for engaging students in online classes. The ability of student teacher candidates can be classified according to teaching needs as a complex component.

The change from face-to-face to distance learning raises several challenges. One of the crucial challenges in distance learning is increasing teacher competence in utilizing information technology (Hamid et al., 2020; Sawitri et al., 2019; Triyanto, 2020). Teachers are required to manage digital-based learning so students can learn synchronously and asynchronously so that the quality of learning can be maintained even if it is done in a virtual space (Zainudin & Utami, 2021). Regarding digital-based learning processes, teachers can use paid or free applications, such as: Sevima Edlink, Moodle, Google Class, Etmodo, or Schology (Arikarani & Amirudin, 2021). Therefore, one of the crucial challenges in distance learning is the teacher's pedagogical competence in utilizing information technology as a medium for providing digital-based learning.

The ability to design pre-learning syntax is quite high, seen from the ability to prepare space, tools and learning media in a conducive manner. ensure virtual space Zoom/G-meet/

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Webex or other media by checking network stability. check student readiness virtually by viewing attendance on the learning page. ensure synchronization of teaching materials, media and other learning tools with the learning elements used. Virtually every student has the same proportions in front of the camera. Therefore, teachers cannot easily provide collaboration space for all students. In accordance with Sadtyadi and Kartowagiran (2014), the educational tasks of a teacher include three indicators: (1) developing educational plans, (2) implementing learning programs, and (3) monitoring learning programs.

Starting with opening the lesson, teachers can start with apperception by utilizing interactive multimedia learning resources. Concrete learning planning consists of the teacher's ability to utilize various learning media, conveying competencies/goals to be achieved and activity plans through interactive forms of learning, both the devices used, and the procedures designed. Teachers should use multiplatform assistance so that the learning process that is built can be maximized and can realize the connectivity that is built at the beginning of learning. In general, good planning can show good, applicable, and interactive mastery of learning material.

The ability to plan information technology-based learning is realized in the form of the ability to apply various forms of learning resources (print, non-print, modules, and other multisources). Teachers are directly expected to be able to link the material with other relevant knowledge that can be found in various other multimedia learning sources, especially material that is integrated with digital and multiplatform access (Sudaryanto et al., 2021; Sudaryanto, Ulya, et al., 2020). Teachers are optimally expected to be able to integrate scientific work in learning through various forms of learning processes packaged in various interactive media, drawing learning conclusions towards discovery of concepts through interactive learning in virtual space, optimizing the virtual space developed by the teacher is carried out by implementing learning in accordance with the competency objectives to be achieved through various existing learning technologies, mastering the class in online learning which is planned interactively by collaborating with multiple virtual rooms, and carrying out contextual learning in online learning which is planned interactively by collaborating in multi-virtual spaces. Teachers carry out learning that allows the growth of positive habits (nurturant effect) with various existing learning technologies.

Digital-based learning is able to show the existence/availability of media in learning with various existing learning technologies, to demonstrate skills in using learning resources/learning media, and to produce interesting messages with various existing learning technologies (Agius et al., 1992). Indirectly, digital teachers can foster active student participation through interaction between teachers, students and learning resources, even though they are limited to virtual meeting rooms and learning media (learning tool technology). I respond positively to student participation with various existing learning technologies (Jewitt, 2012; Scardamalia & Bereiter, 2006). I am able to demonstrate conducive interpersonal relationships even though it is limited to virtual meeting rooms and learning media (learning tool technology). Indirectly, teachers in planning digital learning are able to foster students' joy and enthusiasm in learning and monitor learning progress even though it is limited to virtual meeting rooms and learning media (learning tool technology). Even though the lesson is only limited to the virtual meeting room and learning media (learning tool technology), the teacher conducts a final assessment in accordance with competency/goals at the conclusion of the lesson. The teacher additionally employs spoken language clearly and fluently even though the lesson is only limited to the virtual meeting room and learning media (learning tool technology), despite being restricted to online forums and learning media (learning tool technology), use clear and accurate writing.

In virtual learning that utilizes digital literacy, teachers reflect or make summaries by involving students even though it is limited to virtual meeting rooms and learning media (learning tool technology). The follow-up action chosen by prospective teachers is to provide direction, or activities, or assignments as part of remedial/enrichment. The activity is given to be conducted next week or the next meeting.

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CONCLUSION

Multiplatform-based learning planning is a form of educational acceleration that answers the learning challenges of the 21st century. Each learning tool is an alternative form of problem solving to see future educational learning needs. The description of multiplatform-based learning planning developed online certainly directs teachers to think creatively with innovative forms of learning that continue to be developed. The teacher's ability to express creative ideas to package and present varied online learning tools supported by selecting the right application media can make students more motivated, active, and enthusiastic about participating in online learning. Teachers in online learning need to convey instructions clearly, coherently, and purposefully so that they can easily be understood in conveying information on assignments, online learning, assessments and measuring students' abilities.

Students' ability to plan learning is constructed by pre-learning, planning to open learning, mastering the material, learning models chosen, learning resources and media, skills involving students in learning, student engagement, assessing processes and results, mastery of interactions, and closing skills of learning. The scale of abilities obtained is highest in four competencies, which are pre-learning, planning to open learning, and closing learning. Meanwhile, the lowest ability lies in the learning sources and media developed by prospective teachers.

In accordance with the conclusion above, in planning online learning, the problem faced by teachers is not just determining the indicators that best suit the basic competencies to be achieved, but teachers need to pay attention to the condition of students, learning conditions and environment, as well as learning adaptations that continue to change according to with the unique learning process of each student. The main goal prioritized in online learning is to facilitate learning activities and create a learning experience for students. The online learning process will run effectively when the teacher designs each learning device which is supported by the availability of supporting media. The learning tools prepared by the teacher must be mapped with various online application media platforms that will be used such as WhatsApp, Office 365, Quizizz, Edmondo, digital classes, Zoom Cloud, and supporting features so that they remain integrated. The initial stage of teacher preparation before conducting online learning as outlined in the online Learning Preparation Plan (RPP) is how to package online learning materials in an interesting and varied way.

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