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Development and initial psychometric evaluation of digital literacy and resilience scales among university students in ASEAN

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Abstract

The transition to Society 5.0 requires all individuals, including university students, to adapt to digitalization and information technology. Ensuring students develop the necessary competencies for digital education is essential to prevent them from being left behind. While studies on digital literacy and efficiency in the context of Society 5.0 exist, research focusing specifically on Southeast Asian university students remains limited. This study aims to develop and validate a digital literacy and digital resilience scale for students in Indonesia, Malaysia, and Timor Leste. The initial instrument comprised 45 items measuring five dimensions of digital literacy, which include information and data literacy, communication and collaboration, digital content creation, security, and problem-solving. It also included 29 items assessing four factors of digital resilience, which are knowing, understanding, learning, and recovery. A total of 864 students participated, with 34 percent male and 66 percent female. Psychometric testing involved exploratory factor analysis using JASP 0.16.3.0 and confirmatory factor analysis. The final scale consists of 27 valid and reliable items, with 16 measuring digital literacy and 11 measuring digital resilience. Confirmatory factor analysis results indicate that the models are well-fitted. This instrument provides a valuable tool for assessing students' digital literacy and resilience, supporting efforts to enhance digital competencies in higher education.

Keywords: ASEAN; digital literacy; digital resilience; students

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1. INTRODUCTION

The COVID-19 pandemic has affected various sectors of human life, including the world of education. This condition makes changes in educational activities, one of which is learning activities. Traditional forms of learning cannot be carried out, given the situation does not allow gathering, so alternative online learning is carried out (Armstrong-Mensah et al., 2020; Şavkın et al., 2021; She et al., 2021; Syahruddin et al., 2021). Online learning activities are closely related to the integration of digital technology. In developing countries such as Indonesia and several countries in the Southeast Asian region, not every university has yet reached the full stage of digital transformation in its educational activities, which has an impact on harder efforts as students and academics make the switch to digital academics (Adedoyin & Soykan, 2023).

The issue of digital transformation for higher education institutions has recently attracted the attention of researchers, both in terms of its impact on the learning process and institutional operations. (Farias-Gaytan et al., 2022; Spante et al., 2018). The integration of digital technology in online learning is certainly closely related to digital competence for users. Among students in the subject of online learning, digital competencies are necessary to achieve success in online learning (Ko et al., 2022; Bennett et al., 2008; Ting, 2015).

Digital literacy is one of the most important skills in the era of online learning (Alsowat, 2022; Reddy et al., 2020). Research that has been done by Wang and He (2022) shows that the theme of the field of digital literacy is closely related to the integration of digital technology. In addition, digital literacy is also closely related to online risks (Purnama et al., 2021). Therefore, to achieve the successful implementation of online learning in higher education, digital literacy skills among students need to get attention as an integral part of the digital era. Academics and policymakers believe that digital literacy is an important part of higher education (Chang & Kuo 2025; Purnama et al., 2021). These skills will help me to overcome academic barriers that occur in online learning activities in universities (Arslantas & Gul, 2022). Students will be able to carry out independent learning off-campus in a responsible manner (Ting, 2015).

A new concept that is also closely related to digital literacy is digital resilience, which is an important part of the issue of transformation from the conventional world to the digital world (Sharma et al., 2022). Digital resilience is a construct related to the ability of individuals, including learners, to recognize and manage the risks and threats they face while working or learning digitally through the internet network (Sun et al., 2022). This construct also relates to how they can reflect digital information responsibly, meet ethics, and not deal with criminality or breaking the law (Rodrigo et al., 2024). Digital literacy and digital resilience are both very vital competencies that a student has in achieving success in the era of society 5.0, both in learning and competition in their future careers (Furstenau et al., 2022; Lee, 2009). The higher the skill level, the better the participation in online learning. Although until now there is no empirical evidence from the results of research that states that digital literacy and digital resilience have a positive effect on the success of online learning among students, experts believe that digital literacy and digital resilience are important for students in today's digital era (Grant & Clarke, 2020; Tim et al., 2021).

The attention to the mastery of digital literacy and digital resilience among students in the era of Society 5.0 underlies the importance of developing this instrument. Although some researchers have developed instruments to measure digital literacy among adolescents (Johnson et al., 2021; Reddy et al., 2023; Rodríguez-De-dios et al., 2016). However, some have not been accompanied by factors and items to measure digital resilience. For this reason, in this study, the scale of digital literacy and digital resilience among students was developed as an effort to complement the limitations of measurement instruments about existing digital literacy.

1.1. Literature review

1.1.1. Digital literacy

There are at least eight skills that are important for everyone to face life in the 21st century, the era of the industrial revolution 4.0 and society 5.0, including leadership, digital literacy, communication, emotional intelligence, entrepreneurship, global citizenship, problem-solving, and teamwork (Dede, 2010). Of all these competencies, digital literacy is one of the main competencies that is predicted to be one of the keys to a person's success in the current era (Deja et al., 2021; Liang et al., 2021; Naeem & Mushibwe (2025)), because through these competencies one allows obtaining other key competencies, for example language, mathematics, learning about how to learn, cultural awareness and other broader literacy (Calderón et al., 2020).

Digital literacy is essentially the ability to understand and use information in various formats from various sources available on a computer (Buchan et al., (2024); Audrin & Audrin, 2022; List, 2019; Rodríguez-de-Dios et al., 2016; Üstündağ et al., 2017). Then he can also be referred to as proficiency and accuracy in accessing information from digital sources of information for work, recreation, and communication, which is characterized by mastery of basic skills in information technology, such as; the use of computers to obtain, assess, store, produce, present and exchange information, as well as to communicate and participate in social networks via the Internet (Weller & Anderson 2013). A more recent opinion states that digital literacy refers to a person's capacity to use digital technology consciously and critically (List, 2019) be it to do problem solving, communicate, manage information, collaborate, and build effective knowledge (Polizzi, 2020).

The development of digital competencies should be considered as a set of instrumental skills toward productive and strategic personal competencies (Velyako & Musa 2024). Mastering basic tools and computer applications is only the first step towards advanced knowledge, skills, and attitudes. The development of digital competencies must cover at least two levels: the conceptual level of recognizing the main areas of digital competence and the second is that it concerns the learning and assessment tasks that exist in operating digital common tools and platforms (Üstündağ et al., 2017).

Until now, the concept of digital literacy and the framework for the development of digital literacy continue to develop in line with the dynamics of the development of the progress of the existing digital system. Aspects of digital competence are also so varied that there are no general concepts or definitions that are globally standardized. The theoretical framework on digital competencies proposed by the Commission of the European Community (UK Council for Internet Safety, 2019; Audrin & Audrin, 2022; Chen et al., 2021) became the main reference in the study of digital literacy. Such dimensions include: 1) instrumental knowledge and skills for the use of digital tools and media, 2) k advanced skills and knowledge for communication and collaboration, information management, learning and problem solving, and meaningful participation, and 3) the use of strategic skills in an intercultural, critical, creative, responsible, and independent manner. In the elaboration of such dimensions, instrumental knowledge and skills are the main prerequisites for developing or acquiring skills in a more advanced dimension. In this study, digital literacy as part of digital competence consists of several dimensions, namely (1) information and data literacy, which means a person's literacy ability in exploring, searching, filtering data, evaluating, and managing data, information, and digital content. 2) Communication and collaboration mean a person's literacy ability to interact, share, collaborate, and engage as a citizen through digital technology, netiquette, and managing digital identities. 3) Digital content creation means one's literacy ability to develop, integrate, and recompose digital content, copyright, licensing, and programming. 4) Safety means a person's ability to protect devices, personal data, privacy, health, well-being, and the environment. 5) Problem solving, which is a person's literacy ability to overcome technical problems, identify technological needs and responses, be creative using digital technology, and identify digital competency gaps.

1.1.2. Digital resilience

Digital technology makes it easier for everyone to obtain information, overcomes its problems related to distance and time, and plays an important role in collective efforts for sustainable development. Changes in the order of life in this digital era require people to have competence so as not to be trapped or mired in various problems related to their interaction with the digital world, so preparing humans with digital resilience or resilience is a transformative journey. (Cuel et al., 2022; Soetekouw & Angelopoulos, 2024).

Conceptually, digital resilience comes from the term psychological resilience, used when a person demonstrates a good ability to rise and survive when experiencing serious challenges or difficulties. (Suranata et al., 2017). In an academic context, resilience refers to the capacity of learners/students to overcome acute or chronic difficulties in an academic setting that can seriously threaten their academic success. (Morales, 2014; Winders, 2014). Students who have resilience are those who can maintain motivation, achievement, and performance in learning while being able to overcome and face stress events. (Brewer et al., 2019; Cole et al., 2015). Over the past decade, this construction has been contextualized in different settings and disciplines and, more recently, has been introduced into the digital sphere (Soetekouw & Angelopoulos, 2024). From the concept of psychological resilience, it can be simply mentioned that digital resilience is related to a person's ability to obtain security in cyberspace and avoid various forms of intimidation or violations. Digital resilience for university students is the ability to overcome the difficulties faced in interacting with technology, including surviving with online learning, which requires high adaptation in the use of various digital *platforms*, including resilience in surviving digital technical disturbances in *Online* learning (Mehedintu & Soava 2022; Weller & Anderson 2013).

Digital resilience is defined as an important source for running human life in the digital age. Digital resilience is also interpreted as a dynamic asset of personality that grows from digital activation, that is, engaging according to online opportunities and challenges, not through avoidance and security behaviors (UK Council for Internet Safety, 2019). Digital resilience in this context refers to the use of technology as the internet in the digital era and society 5.0. Digital resilience plays a role in recognizing and processing knowledge gained from technological developments through digital platforms so that people 5.0 can socialize and work online (Third et al., 2014; Yue et al., 2021).

Digital resilience can also be understood as a step to create resilience to various forms of enemies that threaten society 5.0 in the communication space or digital interaction space (Jin et al., 2020; Weller & Anderson 2013; Wright, 2016). Forms of digital resilience may include measures to anticipate, introduce, and defend against threats that exist in the digital world Digital resilience or digital resilience cannot be separated from the context of policymaking, community culture, and social situations. These three contexts, in an effort to create digital resilience, show an understanding that society 5.0 has various aspects related to public awareness, changes in people's behavior, and community adaptation (Wright, 2016). Creating digital resilience from a social perspective is an important step towards sustaining human life as an individual and society (Hatlevik & Bjarnø, 2021). In this study, digital resilience consists of several dimensions, namely 1) Understanding, meaning that a person understands when they are at risk online and can make the right decisions about the digital space they are in. 2) Learning means that a person learns from their experiences and can adapt to their future choices if possible. 3) Knowing means that one knows what to do to seek help from the right sources. 4) Restore means that one can recover when something goes wrong online by receiving the appropriate level of support to aid recovery.

1.1.3. The relationship between digital literacy and digital resilience

Digital literacy is the main competency of success for society, including students and students *in the era of society* 5.0. Those who are incapable of mastering digital literacy, or technological stuttering. However, mastery of the dimensions of digital literacy skills alone is not enough to compete in the current digital era and society 5.0. Since the digital world also presents various risks that threaten society as a user (Bjola & Papadakis, 2021). All

skills in digital literacy need to be equipped with digital resilience to avoid various forms of intimidation, violations, *cybercriminals,* and various forms of threats in the digital world (Grant & Clarke, 2020; Tim et al., 2021).

Learning in higher education from the perspective of 5.0 community demands the ability of students to be resilient in processing meaningful information by involving data, information, and knowledge. This digital resilience is based on digital skills acquired early on or from the moment you go to college, even in the first year (Greene & Crompton 2025; Cuel et al., 2022; Hatlevik & Bjarnø, 2021). There have been no studies that show the relationship between digital literacy and digital resilience, but in digital iteration, there is the ability to obtain security and comfort in using or working in digital media. (Çetin, 2021; Hamutoğlu et al., 2019; Kaeophanuek et al., 2018).

1.2. Purpose of the study

To produce reliable instruments, scale psychometric trait testing is carried out to produce valid and reliable goods. In addition, the involvement of students across countries (Indonesia, Malaysia & Timor-Leste) as participants to produce English and Indonesian versions of instruments that can later be expanded in the context of Association of Southeast Asian Nations (ASEAN) culture. This new instrumentation tool is expected to contribute to policy makers in higher education institutions to explore the level of digital literacy skills and digital resilience of students related to online learning.

2. METHOD AND MATERIALS

2.1. Participants

The large survey area involved students from Indonesia, Malaysia, and Timor-Leste. A total of 864 students participated in the study, with 34% male and 66% female. There were 584 from Indonesia, 177 from Malaysia, and 103 from Timor-Leste with an average age of 22.13 and a standard deviation of 6,552 (Table 1).

Table 1

Participant demographic information

Demographic	n = 864	%
Age	22.13 (Mean)	6.552 (SD)
Gender		
Man	294	34
Woman	570	66
Nationality		
Indonesian	584	67.6
Malaysia	177	20.5
Timor-Leste	103	11.9

2.2. Data collection instrument

The scale of digital literacy and resilience was developed by researchers following the framework of the concept of digital literacy by the UK Council of Internet Safety (UK Council for Internet Safety, 2019). Digital literacy factors include information and data literacy, communication and collaboration, digital content creation, security, and solving. Digital resilience factors include knowing, understanding, learning, and recovering. A total of 45 digital literacy items and 29 digital resilience items were developed on a 1- 5-point Likert scale from "almost needed guidance" to "most advanced and specialist". The Digital Literacy and Resilience Scale was evaluated by three judges, who assessed the understanding of the items. After that, some terms are modified so that they become easy-to-understand scale items and more precisely measure the factor you want to measure. This scale was developed in the Indonesian version as well as in The Republic of Indonesia to make it easier for participants who come from outside Indonesia and become volunteers.

2.3. Data collection procedure

Online surveys based on "Office Forms" are shared via links on WhatsApp messages starting from July 14 until August 14, 2022. A total of 864 respondents fully responded to this survey by the specified time limit. With the collaboration of Candiasa and Nyoman Trisna Herawati, there was a shared link survey for students in Indonesia (Universitas Pendidikan Ganesha & Universitas Nusa Cendana), Abu Yazid Abu Bakar for students in Malaysia (University Kebangsaan Malaysia), and Augusto Da Costa for students in Timor-Leste (Instituto Superior Cristal). Respondents participated voluntarily, regardless of their gender and socio-demographic status (Chusniyah et al., 2020). Participants are given the option to fill out the survey form in English or Indonesian.

2.4. Data analysis

Data is collected from respondents through screening by Microsoft Excel, and the next step is to perform the analysis. First, demographic analyses such as age, gender, and nationality were performed by IBM SPSS Statistics 25. Second, exploratory factor analysis (EFA) was performed by JAS-P 0.16.3.0. There are five factors for digital literacy and four factors for digital resilience. According to the theoretical concepts used in the study, the total factors are the same. Third, confirmatory factor analysis (CFA) was performed by IBM Amos 22. To obtain a fit model, items that are not suitable for measuring construction have been removed (Apriliana & Suranata, 2019). To determine the fit criteria model, Chi-Square with p-value > 0.05, (Adjusted) Goodness of Fit (GFI ≥ 0.95 and AGFI ≥ 0.90), Comparative Fit Index (CFI ≥ 0.90), Normed Fit Index, (NFI ≥ 0.95), Root Mean Squared Error of Approximation (RMSEA < 0,08) (Parry, 2017).

3. RESULTS

3.1. Factor measurement: Exploratory factor analysis (EFA)

The results of factor measurement with 45 items of digital literacy and 29 items of digital resilience, in digital literacy include five factors and digital resilience includes four factors. All factors on digital literacy are the same according to theoretical concepts with five factors. Thus, the five factors that have been adapted to the theoretical concepts found at this stage include information and data literacy (F1), communication and collaboration (F2), digital content creation (F3), security (F4), and problem-solving (F5). Furthermore, all factors of digital resilience are the same according to theoretical concepts with four factors. Thus, four factors are adjusted to theoretical concepts with know (F1), understand (F2), learn (F3), and recover (F4).

The value of the correlation factor in digital literacy ranges from 0.533 – 0.765. High correlation at factor 5 and factor 1 with a value of 0.765 and lowest at a factor of 5 and a factor of 4 with a value of 0.533 (see table 2).

Table 2

Factor correlations on digital literacy

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1				
Factor 2	0.689			
Factor 3	0.647	0.670		
Factor 4	0.549	0.717	0.715	
Factor 5	0.765	0.707	0.624	0.533

In digital resilience, the value of the correlation factor ranges from 0.324 – 0.586. The value of the correlation factor is high at 0.586 in factor 2 with a factor 1, and the lowest is 0.324 in factor 4 with a factor of 3 (see table 3).

Table 3

Factor correlations on digital resilience

	Factor 1	Factor 2	Factor 3
Factor 1			
Factor 2	0.586		

Factor 3	0.478	0.395	
Factor 4	0.523	0.478	0.324

3.2. Measurement model: confirmation factor analysis (CFA)

The results of model testing on 45 digital literacy items with 5 constructs and 29 items of digital resilience with 4 constructs, the resulting model is not suitable. Some items are not suitable for measuring construction, so some items are deleted. A total of 29 items on construct digital literacy and 18 items on construct digital resilience were removed.

The data in Figure 1 shows that it fits the digital literacy model. CFI, GFI, AGFI, RMSEA, and NFI values are adequate. In the model, the problem-solving construction has many more items than others. There are five items such as PS_1, PS_5, PS_8, PS_10, and PS_11, about building troubleshooting. Digital content creation and information and data literacy are built by who owns the item at least. There are two items, DCC_6 and DCC_5, for the construction of creating an IDL_4 digital content and IDL_5 for the construction of information and data literacy. In the construction of communication and collaboration, there are four items: CC_2, CC_3, CC_5, and CC_6. Finally, on safety construction, there are three items: S_6, S_8, and S_9. Validation values on all items can be seen in Table 4.

The data in Figure 2 shows that, according to the digital resilience model. CFI, GFI, AGFI, RMSEA, and NFI values are adequate. In the model, the recovery construction has many more items than others. There are four items, K_6, U_3, R_2, and R_5, on recovery construction. To know and understand is to build on who owns the item at least. There are two items, such as U_5 and K_5 for tofu and L_2 constructs and U_8 for understanding construction. Finally, on the construction of learning, there are three items: L_3, L_4, and L_6. Validation values on all items can be seen in Table 4.

Table 4

Standardized regression weights item digital literacy and resilience scale

	Item	Estimate
Digital Literacy		
IDL_4	Selecting valid/trusted digital information search results	0.801
IDL_5	I can manage and group data links/data links on computers/smartphones/tablets or other digital devices and find them easily whenever I need them	0.806
CC_2	I can start and host online class meetings	0.722
CC_3	I can add or group participants in certain online rooms for online meeting activities	0.732
CC_5	I am able to initiate and organize groups to work on/edit documents online	0.771
CC_6	Create and manage survey instruments and/or online discussion forums to collect data/information from the public	0.873
DCC_5	Avoid violating the simple rules of copyright and license that apply to data, information, digital content, or internet	0.917
DCC_6	Using simple coding to complete simple programming	0.900
S_6	Recognize the privacy policy statement on how personal data is used in digital services	0.837
S_8	Recognize how to use digital technology to keep you engaged in social circles	0.813
S_9	Implement ways to protect your social environment from the impact of digital technology and its use	0.863
PS_1	Understand the occurrence of problems when working with digital devices and systems or programs	0.767
PS_5	Implement simple ways to adapt and consider digital tools and digital programs to my environmental conditions	0.883
PS_8	identify what digital skills and capabilities need improvement	0.729

PS_10	Looking for references to solve problems in content development, programs, and digital that I don't know about	0.764
PS_11	Find a friend or a more advanced expert to discuss obstacles to digital work	0.697
Digital Resilience		
K_5	I recognize the symptoms of psychological disorders that occur when I access the internet for too long (K5)	0.521
U_5	I know how to overcome the boredom and stress of working with digital devices and the internet (U5)	0.748
U_8	I get the opportunity to propose a problem-solving idea regarding digital system disturbance at my university (U8)	0.459
L_2	I learned how to file a complaint if I get violent or criminal acts on the internet/digital (cybercrime) (L2)	0.897
L_3	I always try to find reference sources to overcome mental disorders as a result of digital interactions and work on the internet (L3)	0.826
L_4	I'm looking for information about other forms of ethical and legal violations in sharing content on the internet (L4)	0.816
L_6	I'm learning about how to deal with disruptions in digital access (academic systems, e-learning systems, other systems) (L6)	0.725
K_6	I am able to control myself and my time to work online to avoid psychological pressure (K6)	0.662
U_3	I can control myself to stop surfing the internet or using social media (U3)	0.768
R_2	I am able to calm myself down when I am feeling bored or stressed from working digitally or on the internet (R2)	0.675
R_5	I am able to overcome addiction/dependence with social media, online gaming, or accessing digital/internet content that I like (R5)	0.603

Table 4 shows that the items are valid and reliable size construction variables. In digital literacy, a total of 16 items with an estimated range of values of 0.697–0.900. On digital resilience, a total of 11 items with an estimated range value of 0.459-0.897. Thus, there are 27 items about the scale of digital literacy and resilience among students.

Figure 1

Appropriate Digital Literacy Model

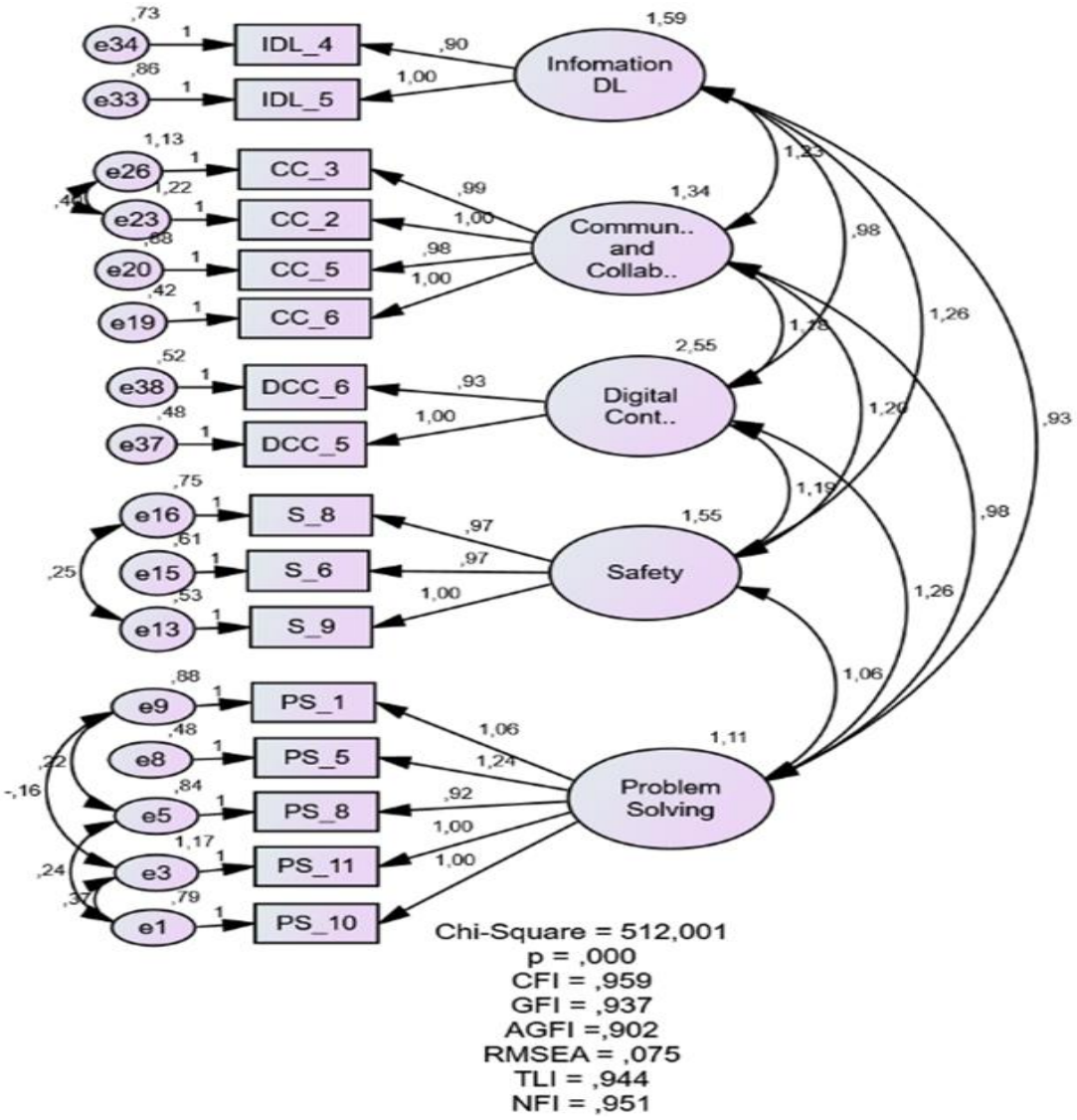
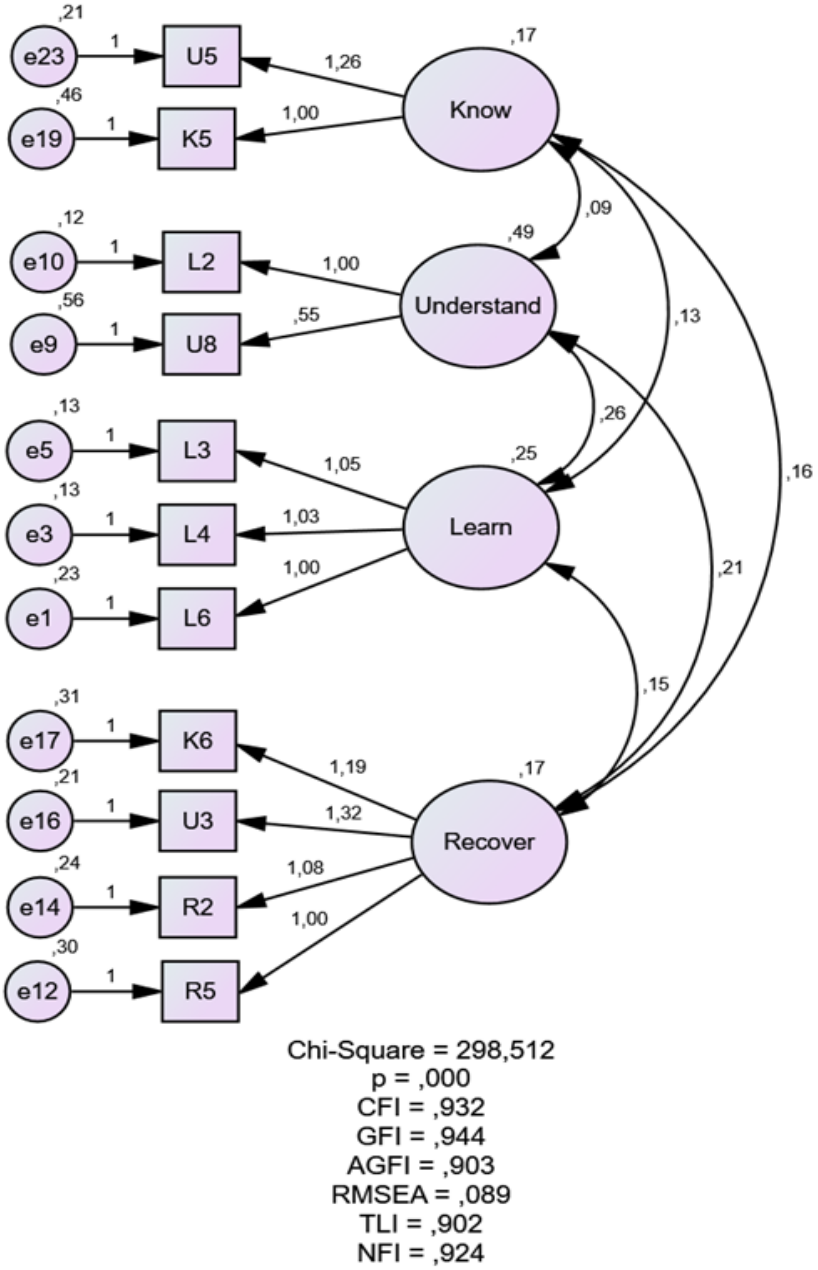


Figure 2

Suitable digital resilience models



4. DISCUSSION

This study aimed to develop and assess the psychometric properties of a digital literacy and resilience scale for students. The initial development was grounded in existing theoretical frameworks and successfully resulted in the creation of 45 items for digital literacy and 29 items for digital resilience. These items were produced in both English and Indonesian versions. Expert consultations were conducted during the development process to ensure the theoretical and practical relevance of the items. Subsequent refinements were made based on feedback from three experts, ensuring that the English and Indonesian versions conveyed the same meaning.

The exploratory factor analysis (EFA) results indicated that the 45 digital literacy items were organized into five factors and the 29 digital resilience items into four factors. The correlations between the factors were deemed acceptable, with values ranging from 0.324 to 0.769. These factors aligned with the theoretical concepts underpinning the constructs. Digital literacy included information and data literacy (F1), communication and collaboration (F2), digital content creation (F3), security (F4), and problem-solving (F5). Digital resilience consisted of knowledge (F1), understanding (F2), learning (F3), and recovery (F4).

Confirmatory factor analysis (CFA) was performed on the 45 digital literacy items and 29 digital resilience items; however, the model did not initially meet the required fit indices. Modifications were made by removing items that did not align with the constructs. For digital literacy, 29 items were removed, leaving 16 items that fit the construct with standardized regression weights ranging from 0.697 to 0.900. For digital resilience, 18 items were removed, leaving 11 items that fit the construct with standardized regression weights ranging from 0.459 to 0.897. All final models were categorized as fit, as the indices for Chi-Square, CFI, GFI, AGFI, RMSEA, TLI, and NFI met the standard criteria.

The final digital literacy and digital resilience scales, consisting of 16 items for digital literacy and 11 items for digital resilience, demonstrated highly satisfactory psychometric properties. These scales were reliable and consistently measured the intended constructs. The scales, available in both English and Indonesian versions, could serve as useful tools for stakeholders to assess the digital literacy and resilience levels of students.

Digital literacy and resilience were critical competencies for students in the digital age. Academic activities increasingly relied on digital technologies, making it essential for students to possess these skills. These competencies enabled students to effectively navigate digital challenges, thereby optimizing their academic performance. Online learning, which integrated digital technologies, was particularly dependent on students' digital skills, as it could be most effective when students possessed higher levels of digital competence.

The development of the digital literacy and resilience scales faced some limitations. The instrument was developed with a sample of students from Indonesia, Malaysia, and Timor-Leste, representing a limited portion of the ASEAN student population. Consequently, the sample size and regional coverage were insufficient to fully represent the diversity of the ASEAN region, suggesting that further expansion of the sample was necessary. Future research should aim to test the scale on a more diverse population to ensure broader applicability. Additionally, the psychometric evaluation was conducted using Classical Test Theory (CTT), which primarily assessed item validity, construct factors, and scale reliability. Future studies should consider using Item Response Theory (IRT), which offers a more nuanced understanding of psychometric properties (Cappelleri et al., 2014), to further enhance the scale's assessment.

5. CONCLUSION

The study demonstrates that the digital literacy and digital resilience scales developed for Asian students have undergone rigorous testing and have proven to be reliable and valid measurement tools. A total of 27 items were generated, with 16 items designed to measure five factors of digital literacy: information and data literacy, communication and collaboration, digital content creation, security, and problem-solving. Additionally, 11 items were created to measure four factors of digital resilience, namely, knowledge, understanding, learning, and

recovery. These items were carefully developed and refined to ensure their relevance and accuracy in assessing the key constructs of digital literacy and resilience

Despite the positive outcomes, the study acknowledges several limitations. Specifically, the sample used in this study was limited, and the population represented does not fully encompass the diverse range of students across the broader Asian context. Therefore, future research should aim to examine the psychometric properties of these scales using a larger and more diverse sample, encompassing students from various countries within the region to ensure the generalizability of the findings. Furthermore, while the study employed Classical Test Theory (CTT) for psychometric evaluation, it is recommended that future studies use more advanced psychometric methods, such as Item Response Theory (IRT), to conduct a more comprehensive analysis of the scales. This would allow for a deeper understanding of the dimensional structure, item-level performance, and the reliability of the scales across different populations, ultimately enhancing the accuracy and applicability of these tools in diverse educational settings.

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Dataset availability: Datasets related to this article can be found at https://data.mendeley.com/datasets/zvpvp3jdbf/1 an open-source online data repository hosted at Mendeley Data.

Conflict of Interest: The authors state that they do not have competing financial interests or personal relationships that may arise to influence the work reported in this paper.

Ethical Approval: Hereby, the authors state that all participants in this study are willing to become respondents of their own accord without any pressure from the researcher or related stakeholders. They also stated that they agreed to publish the results of this survey because there was no negative impact on the respondents' personality. In addition, the personal identity of participants is anonymous. This research has been approved by the ethics committee of Ganesha University of Education, Bali, Indonesia, with ethical license number 1093/UN48.16/LT/2022.

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