Cakrawala Pendidikan
Jurnal Ilmiah Pendidikan
Vol. 42 No. 3, October 2023, pp. 781-790
https://journal.uny.ac.id/index.php/cp/issue/view/2547
DOI: https://doi.org/10.21831/cp.v42i3.59703

Construct validity of the instrument of digital skill literacy

Muhammad Harlanu[1]*, Agus Suryanto[1], Syahrul Ramadhan[2], Endang Wuryandini[3]
[1]Universitas Negeri Semarang, Semarang, Indonesia, [2]UIN Sunan Kalijaga, Yogyakarta, Indonesia, [3]Universitas PGRI Semarang, Indonesia
*Corresponding Author: harlanu@mail.unnes.ac.id

ABSTRACT

This research is descriptive research that is conducted by quantitative approach to find out the validity and reliability of an instrument. The population in this research is all active college students at the State University of Semarang in nine faculties, taking sample is conducted by probability-sampling that means all population has the same chance to be a research subject. The number of samples in this research is 300 of people. The technique of data analysis on the validity verification in this research used Confirmatory Factor Analysis (CFA) technique. Meanwhile, for the estimation of reliability, the researcher used the formula of Cronbach's Alpha. The data analysis is supported by JAMOVI program. The result of research shows that a) the instrument of digital skill literacy has fulfilled the criteria of goodness of fit with the result; 1) x2 = 162 dan df = 143; 2) p-value = 0,133; 3) RMSEA 0,021; 4) SRMR = 0,026; 5) and CFI = 0,99; b) the result of CFA shows 20 items that is divided by the indicator such as functional & skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, & E-Safety have fulfilled valid criteria with the average score of loading factor is 0.80. c) the reliability of literacy digital skill instrument shows the estimation value which is 0.943 or very reliable.

Keywords: Confirmatory Factor Analysis, Validity, Reliability, Literacy digital, Skill digital

Article history

Received:	*Revised:*	*Accepted:*	*Published:*
11 January 2023	*5 February 2023*	*14 April 2023*	*10 Oktober 2023*

Citation (APA Style): Harlanu, M., Suryanto, A., Ramadhan, S., & Wuryandini, E. (2023). Construct validity of the instrument of digital skill literacy. *Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan, 42(3),* 781-790. DOI: https://doi.org/10.21831/cp.v42i3.59703

INTRODUCTION

In today's digital era, the development of information and communication technology has brought significant changes in various fields of life, including education. World change globally drives new habits including generating the intensity of the use of digital devices in learning (Martyr, et al, 2022). Nowadays, the industrial revolution has reached the fourth part or better known as the industrial revolution 4.0 where its development not only leads to increasingly digitized tools, but also to encourage the improvement of human quality to be able to keep up with its changes. One of the big steps to keep up with the change in the industrial revolution 4.0 is the need for digital competence as a provision that every individual needs to have (Syahid, et al., 2022).

The skill in utilizing digital technology properly is a digital skill. Digital skill is a skill of digital including all skills related to the technology such as basic skill or literacy, general skill for all jobs and specific skill for professional in information technology and communication (Motyl et al., 2017). Meanwhile, according to Van Deursen et.al., digital skill is divided into four dimensions including: 1) digital technician skill, 2) digital communication skill, 3) digital analysis, dan 4) digital thinking (Van Deursen et al., 2016).

The use of information technology is a behaviour/attitude of using technology to facilitate in completing tasks and improving performance (Darmini & Putra, 2007). Utilization of information technology is the behaviour of utilizing the use of technology and information

systems in carrying out their duties (Rangriz, 2011). The use of information technology is an individual behaviuor in the use of information systems to facilitate the completion of their tasks (Shahlaei, et al., 2020). Digital skill is one of aspects of digital intelligence that should be known to run and develop a business well (Shahlaei, et al., 2020). Digital skill is a level of knowledge about information and communication tools demonstrated by the ability to build professional interactions in the Internet space, conduct information searches, select, and critically evaluate the information needed and build continuous professional development in open information spaces (Zhestkova, et al., 2020). Therefore, it can be concluded that digital skill is the ability to utilize / use information technology in completing tasks and professional development.

A competency of educational digital closely relate to the educator's skill in using the information technology and communication based on pedagogical rules by realizing their implications for educational methodology (Prayogi & Aesthetics, 2020). According to Blyznyuk (2018), the digital competence of educator is divided into several forms, such as: information, communication, educational content creation, security, educational problem solving.

Education can take the advantage of technology that is now developing rapidly. There are several alternatives in utilizing technology, including by utilizing digital literacy. The use of digital literacy as a form of adjustment to the fourth wave of civilization which is currently known as the educator era 4.0. There is a shift in the direction of education besides in the term of educational technology related to the learning model in the 21st century learning is no longer teacher cantered learning but student cantered learning (Elshet, 2004).

Digital skill needs to be owned by various layers of people's lives today, especially young people that is synonymous with smartphones. By having digital skills, people will be better prepared to face the challenges of today's technology to be able to adapt and arrive at a certain condition (Herpendi & Hafidz, 2021).

Competence derived from the word competence which describes the appearance of a certain ability which is a dialectic (fusion) of knowledge and ability (Sukadinata, 2012). In a general sense, competence has almost the same meaning as life skills, such as skills, skills to express, maintain, keep, and develop self-envy. Competence or life skills are expressed in observable and measurable proficiencies, habits, activities, deeds, or performances. Lankshear et al (2015) classifies them into four core competencies that a person needs to have, so that it can be said to be digitally literate, such as 1) Internet Search; 2) Hypertext Direction Guide (Hypertextual Navigation); 3) Content Evaluation; 4) Knowledge Assembly.

The application of the term emphasizes on the use of information communication technology (ICT) which is accompanied by the proficiency of ICT users in retrieving, assessing, storing, producing, presenting, and exchanging information as well as communicating and participating in collaborative networks via the internet (Johannesen et al., 2014; From, 2017; Ghomi & Redecker, 2019). Digital competence is included in one of the eight key competences for lifelong learning (Tretinjak & Anđelić, 2016). In addition, Indonesia has set an agenda for digitalization efforts in the Making Indonesia 4.0 program for the development of competent digital infrastructure as a direction for accelerating the country's progress (Ministry of Industry RI, 2019).

The instrument that has been arranged needs to be proven its validation and needs to be estimated its reliability, therefore the instrument could be taken the responsibility both its validity and reliability. A good instrument should be able to measure. Besides that, a good instrument could measure a determined variable accurately. Therefore, an instrument is assumed good to measure a certain variable if the level of validity and reliability are fulfilled (Ramadani, et al., 2017). The development of making scale based on the exploration on phycological context of Islam is made with the goal to get the validity and reliability which are good in arranging personal concept in phycological perspective of Islam (Farmawati & Hidayati, 2019; Ramdani, et al., 2018).

The instruments in this research were validated by using the validity of the construct. The validity of the construct in this research uses Confirmatory Factor Analysis (CFA). CFA is a part of factor analysis used to test how far each indicator reflects the dimensions of a construct (Pedhazur, 1997). CFA is different from EFA (Exploratory Factor Analysis) which is used to find

out the number of factors to be measured and determine the classification items that measure certain factors. In the CFA, researcher formed a model first, establishing the number of factors (latent variables) and determining the items (observed variables) that measured certain factors (Wijanto,2008).

The reliability of the instrument can be estimated by several formula tests. Some techniques for estimating the reliability of an instrument that can be used include test-retest, equivalent, and internal consistency. Internal consistency has several different test techniques. The internal consistency reliability estimation technique consists of split half, KR 20, KR 21, and Alfa Cronbach tests. However, in this research, the estimation of instrument reliability was conducted by using Cronbach's Alpha formula. Reliability estimation using the Alfa Cronbach test was conducted for instruments that had a correct answer of more than 1 (Adamson & Prion, 2013). These instruments include instruments in the form of essays, questionnaires.

To measure digital skill literacy, various instruments have been developed by researchers. However, the validity and reliability of the instrument must be ensured to obtain accurate results. Therefore, this study aims to examine the construct validity of the instrument of digital skill literacy. Specifically, this study aims to validate the instrument's indicators, which consist of functional and skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, and E-safety. This study will contribute to the existing literature on digital skill literacy by providing empirical evidence on the construct validity of the instrument. The findings of this study are expected to be useful for educators, policymakers, and researchers who are interested in measuring digital skill literacy among college students.

METHOD

This research is descriptive research with a quantitative approach to examine the construct validity of the instrument of digital skill literacy. The design of this study involves the validation of the instrument indicators using Confirmatory Factor Analysis (CFA) technique, and the estimation of reliability using Cronbach's Alpha formula.

The population is all active students at Semarang State University in nine Faculties, taking sample is conducted by probability sampling techniques which means that all populations have the same opportunity to become research subjects. Meanwhile, the method used in sampling used is purposive sampling where the researcher has determined the sample by setting specific characteristics according to the research. The sample in this study was 300 people.

The instrument used in this study is the instrument of digital skill literacy, which consists of eight indicators, namely functional and skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, and E-safety. Each indicator is measured using several items.

The data analysis technique in proving validity used the confirmatory factor analysis (CFA) technique. Meanwhile, for the reliability estimation, it uses Cronbach's Alpha formula. The two techniques are analysed by the support of the JAMOVI Program. The goodness of fit of the instrument is assessed using several criteria, namely x2, df, p-value, RMSEA, SRMR, and CFI. The loading factor of each item is also examined to ensure the validity of the indicators. Goodness of fit aims to test whether the proposed model has fit to the data or sample. A fit model when the sample covariance matrix is not much different from the estimation covariance matrix (Riadi, 2018).

The validity of the instrument by CFA technique can be seen based on the value of the loading factor. The loading factor value is used to see whether the items in the instrument are valid or not. According to Heir et al (2010) the critical value of factor loading depends on the number of samples, the bigger the number of samples, the critical value of the loading factor is smaller.

Reliability is often referred to as the reliability and stability of a test device, such as how far the test instrument can produce consistent and stable measurement and assessment results. in addition, reliability can also be interpreted as a form of consistency, reliability, reliability and

reliability in every test or measurement of an object whether conducted internally or externally. The reliability criterion is 0.75 or the range of reliability scores moves from 0-1, if it is close to 1 (one) then the more reliable an instrument is (Azwar, 2019).

FINDING AND DISCUSSION

Finding

Goodness of fit (GOF)

In this study, the goodness of fit test was conducted to evaluate whether the proposed model fits the data or sample. A chi-square GOF measurement was used, with a critical value of $0 \leq X2 \leq 2df$, p-value with a critical value of $0.05 \leq X2 \leq 1.00$, Root Mean Square Error of Approximation (RMSEA) with a critical value of RMSEA ≤ 0.08, standardized Root Mean Residual (SMRM) with a critical value of SRMR ≤ 0.05, Comparative Fit Index (CFI) with a critical value of CFI > 0.97, and Normed Fit Index (NFI) with a critical value of NFI > 90 (Hair, 2010). These criteria were selected based on the recommendations of previous studies and expert opinions.

The chi-square test measures the difference between the observed and expected covariance matrices, and the resulting p-value indicates the probability of observing the obtained chi-square value by chance alone. RMSEA measures the discrepancy between the observed covariance matrix and the predicted covariance matrix, with lower values indicating a better fit. SMRM measures the average absolute difference between the observed and predicted covariance matrices, with values closer to zero indicating a better fit. CFI and NFI are incremental fit indices that compare the fit of the proposed model with the null model, with values closer to one indicating a better fit. The following table 1 is the GOF results that have been conducted.

Table 1. The measurement of goodness of fit

GOF measurement	Critical Value	Result	Conclusion
Statistics X^2	$0 \leq X^2 \leq 2df$	df = 143 X^2 = 162	Fit
p-Value	$0,05 \leq X^2 \leq 1,00$	0,133	Fit
RMSEA	RMSEA $\leq$ 0,08	0,021	Fit
SRMR	SRMR $\leq$ 0,05	0,026	Fit
CFI	CFI > 0,97	0,99	Fit

The results of the goodness of fit test as presented in Table 1 indicate that the proposed model for measuring digital skill literacy among college students has a good fit to the data. The chi-square value of 162 with 143 degrees of freedom and a p-value of 0.133 suggests that the proposed model does not significantly differ from the observed data. Moreover, the RMSEA value of 0.021 indicates a good fit of the model. This indicates that the differences between the observed data and the model-predicted data are small, and the model fits the data well. The SMRM value of 0.026 indicates a close fit, which is another indication that the proposed model fits the data well. Furthermore, the CFI value of 0.99 indicates a very good fit of the proposed model to the data. This value is close to 1, indicating that the proposed model fits the data well and that the observed data is well-represented by the model. The NFI value of 0.98 also indicates a good fit of the model.

The results of this study suggest that the proposed model for measuring digital skill literacy among college students is reliable and valid. It can be concluded that the proposed instrument can be used to measure digital skill literacy among college students. This finding is important because it provides a useful tool for educators and researchers to assess the digital skill literacy of college students, which can help to develop and improve digital skill literacy programs in universities.

The result of CFA of digital skill literacy

Factor analysis conducted in the instrument of Digital Skill literacy consist of eight indicators and divided into twenty items. The first indicator is Functional & Skill Beyond, consisting of 2 items. The second indicator is Creativity, consisting of 4 items. The third indicator is Collaboration, which consists of 2 items. The fourth indicator is Communication which consists

of 3 items. The fifth indicator is the ability to find and select information consisting of 2 items. The sixth indicator is critical thinking and evaluation, which consists of 3 items. The seventh indicator is cultural and social understanding, which consists of 1 item. And the last indicator is E-safety which consists of 3 items. The indicators and items are then analysed with the CFA technique with the support of the Jamovi program to find out the loading factor score. The following are the results of the analysis that has been conducted.

Table 2. The result of CFA of the instrument of digital skill literacy

Indicators	Item	Factor Loading	p-value	Explanation
Functional & Skill Beyond	1	0,831	< 0 ,001	Valid
	2	0,903	< 0,001	Valid
Creativity	3	0,828	< 0,001	Valid
	4	0,844	< 0,001	Valid
	5	0,936	< 0,001	Valid
	6	0,625	< 0,001	Valid
Collaboration	7	0,842	< 0,001	Valid
	8	0,724	< 0,001	Valid
Communication	9	0,790	< 0,001	Valid
	10	0,889	< 0,001	Valid
	11	0,733	< 0,001	Valid
The ability to find and select information	12	0,608	< 0,001	Valid
	13	0,837	< 0,001	Valid
Critical thinking and evaluation	14	0,867	<0,001	Valid
	15	0,471	< 0,001	Valid
	16	0,739	< 0,001	Valid
Cultural and social understanding	17	1,149	< 0 ,001	Valid
E-Safety	18	0,762	< 0,001	Valid
	19	0,896	< 0,001	Valid
	20	0,770	< 0,001	Valid

The results of the confirmatory factor analysis (CFA) are shown in Table 2. The loading factor values of all items in the instrument of digital skill literacy were found to be above the critical value. This indicates that all items are valid and contribute significantly to the measurement of digital skill literacy. This result is important as it provides evidence for the construct validity of the instrument, which is a crucial aspect in the process of validating any measurement tool.

Furthermore, the results showed that the 20 items in the instrument were divided into eight indicators or aspects, namely functional & skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, and E-Safety. All eight aspects of the instrument were found to have fulfilled the criteria of construct validity, with an average score of loading factor of 0.80. This suggests that the eight aspects of the instrument are valid and can be used to accurately measure digital skill literacy among college students.

The results of the CFA, combined with the findings from the goodness of fit test, provide strong evidence for the validity of the instrument of digital skill literacy. The high loading factor values and the overall fit of the model to the data indicate that the instrument is measuring what it is intended to measure, and that it is a reliable tool for assessing digital skill literacy among college students. These findings have important implications for future research in the field of digital literacy, as they provide a validated tool that can be used to measure digital skill literacy in a reliable and accurate way.

The reliability of instrument

Reliability is a critical aspect of research that determines the consistency and accuracy of the measurement instrument used in the study. In this research, reliability was measured using the Cronbach's Alpha coefficient, which is a common method used to estimate internal consistency.

Steiner (2003) recommended that a Cronbach's Alpha coefficient greater than 0.70 (ri > 0.70) indicates that an instrument is reliable. The results of the reliability estimation are presented in Table 3 below.

Table 3. The result of reliability estimation

	Cronbach's alpha	Number of Items	Explanation
Instrument Skill digital	0,943	20	Reliable

Table 3 presents the results of the reliability estimation for the instrument of digital skill literacy. The Cronbach's Alpha coefficient for the overall instrument was 0.943, indicating that the instrument has a high level of internal consistency and is very reliable. This means that the items in the instrument are measuring the same construct, and that the results obtained from the instrument are consistent and accurate. This finding indicates that the instrument is internally consistent and produces accurate and reliable results. Thus, the results of this research can be used with a high level of confidence, and the instrument can be recommended for use in future research or practical settings.

Overall, the results of this research suggest that the instrument of digital skill literacy is a valid and reliable tool for measuring digital skill literacy among college students. The confirmatory factor analysis showed that the instrument has good construct validity, and the Cronbach's Alpha coefficient showed that the instrument has a high level of internal consistency and reliability. These findings are important for researchers and educators who aim to assess and improve students' digital skills, as well as for policymakers who want to develop effective policies and programs to promote digital literacy in higher education.

Discussion

The article presented the results of a research conducted to assess the validity and reliability of an instrument designed to measure digital skill literacy among college students at the State University of Semarang. The research used a quantitative approach and collected data from a sample of 300 active college students in nine faculties using probability-sampling. The data analysis used Confirmatory Factor Analysis (CFA) technique to verify the validity of the instrument and the formula of Cronbach's Alpha to estimate the reliability. The results of the research showed that the instrument of digital skill literacy had fulfilled the criteria of goodness of fit and had a very high reliability estimation value of 0.943.

The research identified 20 items that were divided into indicators such as functional and skill beyond, creativity, collaboration, communication, the ability to find and select information, critical thinking and evaluation, cultural and social understanding, and E-Safety. The results showed that these indicators had fulfilled the valid criteria with an average score of loading factor of 0.80. The findings of this research suggest that the instrument of digital skill literacy is a valid and reliable tool for measuring digital skill literacy among college students. The research also provides insights into the factors that contribute to digital skill literacy, which can be used to develop interventions and strategies to enhance students' digital skill literacy.

The use of internet in Indonesia has a major growth over the past decade (Suwana, 2017). Digital transformation and the Internet greatly influence the acquisition of more skills that support their education and preparation for the workplace (Techataweewan & Prasertsin, 2018). Independent learning in the digital age is also a growing phenomenon with implications for the learning process and learner attributes (Curran, et al., 2017; Fahlman, 2013; Scott, et al., 2014). The Internet and digital technologies provide the main infrastructure and communication channels in people's daily lives (Techataweewan & Prasertsin, 2018). Increasing the use of technology has important implications for workplace organizations and policies that can support effective self-learning processes in the digital age (Curran et al., 2019). When technology supports organizational knowledge management, workers need to have digital literacy skills, for instance, how to create information using PowerPoint, media, etc. (Silamut & Petsangsri, 2020).

Literacy is basically the ability to read and write. The person pioneering the concept of 'Digital Literacy' was Paul Gilster in 1997. He defines digital literacy as the ability to understand

and use information from digital sources (Bawden, 2008). But in terminology, Bawden (2008) argues that the concept of 'digital literacy' is almost confusing because it is in the topic of Information Literacy, Computer Literacy, Information and Communication Technology (ICT) literacy, e-literacy, Network Literacy, and Media Literacy.

Individual learning through technology requires not only to have the skill and ability relate to the use of technological tools, but also knowledge of the norms and practices of proper use, known as digital literacy (Mayers, 2013). Technology has a key role to play in supporting knowledge management, but it is necessary to know how to use digital literacy [30]. Digital literacy is a term popularly used today (Gilster, 1997). Digital literacy is defined as an individual skill.

The digital literacy criteria consist of four factors and 12 indicators (Techataweewan, & Prasertsin, 2018), including operation skills, thinking skills, collaboration skills, and consciousness skills. Operation skills have three indicators, which are cognition, invention, and presentation, focusing on knowledge and comprehension of ICT and digital media, the ability to apply and integrate ICT and digital media for various purposes, and the capacity to present digital content effectively. Thinking skills consist of analysis, evaluation, and creativity indicators, focusing on an individual's ability to establish relationships between digital information, assess information accurately, and solve problems positively. Collaboration skills include teamwork, networking, and sharing indicators, evaluating an individual's ability to work collaboratively, build networks, and exchange information appropriately. Consciousness skills have three indicators, ethics, legal literacy, and self-preservation, evaluating an individual's adherence to societal practices, understanding of laws and regulations, and the ability to manage personal data.

However, it should be noted that the research only focused on college students in one university, so the results may not be generalizable to other populations. Further research is needed to validate the instrument and assess the digital skill literacy of other populations.

CONCLUSION

The results of this study showed that the instrument of digital skill literacy has fulfilled the criteria of goodness of fit with a high level of reliability. The indicators of functional and skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, and E-safety have also fulfilled valid criteria. The conclusions in this study are: 1) The digital skill literacy instrument has fulfilled the criteria for goodness of fit, with the results; 1) $x2 = 162$ and $df = 143$; 2) p-value = 0.133; 3) RMSEA 0.021; 4) SRMR = 0.026; 5) and CFI = 0.99. It shows that the instrument has fulfilled the criteria for Goodness of fit items; 2) The CFA results show 20 items, which are divided into functional indicators & skill beyond, creativity, collaboration, communication, the ability to find select information, critical thinking and evaluation, cultural and social understanding, & E-Safety has fulfilled valid criteria with an average loading factor value of 0.80; 3) The reliability of digital skill literacy instruments shows an estimated result of 0.943 or very reliable.

Based on the results of this study, it is recommended that the instrument of digital skill literacy can be used as a tool to measure digital skill literacy among college students in the future. This instrument can provide valuable information regarding the level of digital skill literacy of college students, which can be used to improve their digital literacy skills. In addition, the findings of this study can also be used as a reference for educators and policymakers in developing strategies to enhance digital literacy skills among college students. Although this study has provided significant results, there are several limitations that need to be considered in future research. Firstly, this study only involved college students at the State University of Semarang, which may not represent the general population of college students in Indonesia. Future studies can involve a broader population of college students to obtain a more representative sample. Secondly, this study only focused on the validation of the instrument of digital skill literacy. Future studies can explore other aspects of digital skill literacy, such as the factors that influence digital literacy skills among college students.

AKNOWLEDGEMENTS

The authors would like to express their gratitude to the State University of Semarang, Indonesia, for providing the opportunity and facilities to conduct this research. The authors are also grateful to the staff and faculty members of the university who provided their valuable time and assistance during the data collection process.

REFERENCES

Adamson, K. A., & Prion, S. (2013). Reliability: measuring internal consistency using Cronbach's α. *Clinical simulation in Nursing*, *9*(5), e179-e180.

Allen, M. J., & Yen, W. M. (2001). *Introduction to measurement theory*. Waveland Press.

Azwar, S. (2012). Reliabilitas dan validitas. *Yogyakarta: pustaka pelajar*.

Bawden, D. (2008). Origins and concepts of digital literacy. *Digital literacies: Concepts, policies and practices*, *30*(2008), 17-32.

Cahen, F., & Borini, F. M. (2020). International digital competence. *Journal of International Management*, *26*(1), 100691.

Curran, V., Gustafson, D. L., Simmons, K., Lannon, H., Wang, C., Garmsiri, M., ... & Wetsch, L. (2019). Adult learners' perceptions of self-directed learning and digital technology usage in continuing professional education: An update for the digital age. *Journal of Adult and Continuing Education*, *25*(1), 74-93.

Curran, V., Matthews, L., Fleet, L., Simmons, K., Gustafson, D. L., & Wetsch, L. (2017). A review of digital, social, and mobile technologies in health professional education. *Journal of Continuing Education in the Health Professions*, *37*(3), 195-206.

Darmini, A. A. S. R., & Putra, I. N. W. A. (2009). Pemanfaatan teknologi informasi dan pengaruhnya pada kinerja individual pada Bank Perkreditan Rakyat di kabupaten Tabanan. *Jurnal Ilmiah Akuntansi Dan Bisnis*, *4*(1).

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia*, *13*(1), 93-106.

Fahlman, D. (2013). Examining informal learning using mobile devices in the healthcare workplace. *Canadian Journal of Learning and Technology/La revue canadienne de l'apprentissage et de la technologie*, *39*(4).

Farmawati, C., & Hidayati, N. (2019). Penyusunan dan pengembangan alat ukur Islamic personality scale (IPS). *Jurnal Psikologi Islam dan Budaya*, *2*(1), 19-30.

From, J. (2017). Pedagogical Digital Competence--Between Values, Knowledge and Skills. *Higher Education Studies*, *7*(2), 43-50.

Ghomi, M., & Redecker, C. (2019, May). Digital Competence of Educators (DigCompEdu): Development and Evaluation of a Self-assessment Instrument for Teachers' Digital Competence. In *CSEDU (1)* (pp. 541-548).

Gilster, P. (1997). *Digital literacy*. John Wiley & Sons, Inc.

Gomez-Galan, J. (2018). Media education as theoretical and practical paradigm for digital literacy: An interdisciplinary analysis. *arXiv preprint arXiv:1803.01677*.

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). Multivariate data analysis: A global perspective (Vol. 7).

Herpendi, H., & Hafizd, K. A. (2021). Pentingnya Memiliki Digital Skills Di Masa Pandemi COVID-19. *Jurnal WIDYA LAKSMI (Jurnal Pengabdian Kepada Masyarakat)*, *1*(2), 83-90.

Johannesen, M., Øgrim, L., & Giæver, T. H. (2014). Notion in motion: Teachers' digital competence. *Nordic Journal of Digital Literacy*, *9*(4), 300-312.

Karpati, A. (2011). Digital literacy in education. IITE Policy Brief, May 2011. Moscow, Russian Federation: UNESCO Institute for Information Technologies in Education.

Kemenperin RI. (2019). *Making Indonesia*. In Making Indonesia. Kementerian Perindustrian Republik Indonesia. https://doi.org/10.7591/9781501719370.

Kusaeri & Suprananto. (2012). *Pengukuran dan Penilaian Pendidikan*. Graha Pustaka.

Lankshear, C., & Knobel, M. (2015). Digital literacy and Digital Literacies: policy, pedagogy and research considerations for education. *Nordic Journal of Digital Literacy*, *10*(Jubileumsnummer), 8-20.

Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: an introduction. *Learning, media and technology*, *38*(4), 355-367.

Motyl, B., Baronio, G., Uberti, S., Speranza, D., & Filippi, S. (2017). How will change the future engineers' skills in the Industry 4.0 framework? A questionnaire surveys. *Procedia manufacturing*, *11*, 1501-1509.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research: Explanation and prediction (3rd edition)*. Thomson Learning, Inc.

Prayogi, R. D & Estetika, Rio (2020). Kecakapan Abad 21: Kompetensi Digital Pendidik Masa Depan. *Manajemen Pendidikan*, *14*(2).

Ramadani, M., Supahar, S., & Rosana, D. (2017). Validity of evaluation instrument on the implementation of performance assessment to measure science process skills. *Jurnal Inovasi Pendidikan IPA*, *3*(2), 180-188.

Ramdani, Z., Supriyatin, T., & Susanti, S. (2018). Perumusan dan pengujian instrumen alat ukur kesabaran sebagai bentuk coping strategy. *Jurnal Psikologi Islam dan Budaya*, *1*(2), 97-106.

Rangriz, V. (2011). Information and communication technology & organisational performance: Different approaches to evaluation. *International Journal of Global Business*, *4*(2).

Retnawati, H. (2016). Validitas reliabilitas dan karakteristik butir. *Yogyakarta: Parama Publishing*.

Riadi, E. (2018). Statistik SEM structural equation modeling dengan Lisrel. *Yogyakarta: CV Andi Offset*.

Ruhaena, L. (2015). Model multisensori: Solusi stimulasi literasi anak prasekolah. *Jurnal Psikologi*, *42*(1), 47-60.

Scott, K. R., Hsu, C. H., Johnson, N. J., Mamtani, M., Conlon, L. W., & DeRoos, F. J. (2014). Integration of social media in emergency medicine residency curriculum. *Annals of Emergency Medicine*, *64*(4), 396-404.

Shahlaei, C. A., Rangraz, M., & Stenmark, D. (2020). Conceptualizing competence: A study on digitalization of work practices.

Silamut, A. A., & Petsangsri, S. (2020). Self-directed learning with knowledge management model to enhance digital literacy abilities. *Education and Information Technologies*, *25*(6), 4797-4815.

Sukmadinata, N. S., & Syaodih, E. (2012). *Kurikulum dan pembelajaran kompetensi*. PT. *Refika Aditama*.

Suwana, F. (2017). Empowering Indonesian women through building digital media literacy. *Kasetsart Journal of Social Sciences*, *38*(3), 212-217.

Syahid, A. A., Hernawan, A. H., & Dewi, L. (2022). Analisis kompetensi digital guru sekolah dasar. *Jurnal Basicedu*, *6*(3), 4601-4610.

Techataweewan, W., & Prasertsin, U. (2018). Development of digital literacy indicators for Thai undergraduate students using mixed method research. *Kasetsart Journal of Social Sciences*, *39*(2), 215-221.

Tretinjak, M. F., & Anđelić, V. (2016, May). Digital competences for teachers: Classroom practice. In *2016 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)* (pp. 807-811). IEEE.

Van Deursen, A. J., Helsper, E. J., & Eynon, R. (2016). Development and validation of the internet skills scale (ISS). *Information, Communication & Society*, *19*(6), 804-823.

Wijanto, S. H. (2008). Structure equation modeling dengan LISREL 8.8: Konsep & tutorial. *Graha Ilmu*.

Zhestkova, Y. A., Maklaeva, E. V., Filippova, L. V., Fomina, N. I., & Fedorova, S. V. (2020). Digital competence of a teacher as a means of education process managing in a high school. In *Advances in Social Science, Education and Humanities Research* (pp. 586-592).