JURNAL PENDIDIKAN DAN PENGAJARAN
Volume 55 Nomor 1 2022, 42-52
E-ISSN: 2549-2608; P-ISSN: 2301-7821
DOI: http://dx.doi.org/10.23887/jpp.v55i1.44744

Integrating Information and Media Literacy into Pre-service Special Education Teachers Teaching and Learning

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Abstrak

Maraknya internet dan munculnya perangkat digital baru menuntut pengguna informasi untuk kebutuhan informasi, mengakses informasi secara efektif dan efisien, menerapkan informasi, dan menggunakan informasi secara efektif dan efisien. Penelitian ini bertujuan untuk mengembangkan model integrasi literasi informasi dan media ke dalam pembelajaran pendidikan luar biasa prajabatan. Peneliti menerapkan pendekatan ADDIE. Penelitian ini dilakukan dengan total 214 mahasiswa Program Pendidikan Luar Biasa Guru Prajabatan. Metode yang digunakan untuk mengumpulkan data yaitu observasi dan kuesioner. Instrument yang digunakan untuk mengumpulkan data yaitu kuesioner. Teknik yang dilakukan untuk menganalisis data yaitu kuantitatif dengan format rating scale. Hasil penelitian yaitu sebagian besar siswa memiliki keterampilan literasi informasi dan media yang sangat baik atau baik, baik dalam mengenali kebutuhan untuk dapat mencari, mengakses, dan mengambil informasi dan konten media, memahami, menilai, dan mengevaluasi informasi dan media, serta membuat, memanfaatkan, dan memantau informasi dan konten media. 25,70% siswa memiliki tingkat keterampilan literasi informasi dan media yang sangat baik. Sebagian besar siswa sudah memiliki komputer dengan berbagai sistem operasi dan perangkat mobile seperti smartphone, iPod, tablet, dan kamus elektronik. Siswa menganggap penting bagi mereka untuk meningkatkan keterampilan mereka menggunakan alat digital karena dapat meningkatkan pembelajaran. Disimpulkan bahwa lima komponen Model pembelajaran 5MIL dapat digunakan, agar siswa memiliki kompetensi yang diperlukan untuk kehidupan abad ke-21.

Kata kunci: *Literasi Informasi Dan Media, Pendidikan Luar Biasa, Pembelajaran*

Abstract

The rise of the internet and the emergence of new digital devices require information users for information needs, access information effectively and efficiently, applies information, and use information effectively and efficiently. This study aims to develop a model for integrating information and media literacy into pre-service exceptional education learning. The researcher applied the ADDIE approach. This research was conducted with 214 students of the Pre-service Teacher Special Education Program. The methods used to collect data are observation and questionnaires. The instrument used to collect data is a questionnaire. The technique used to analyze the data is quantitative with a rating scale format. The results of the research are that most students have excellent or good information and media literacy skills, both in recognizing to be able to find, access, and retrieve information and media content, understand, assess, and develop information and media, as well as create, utilize needs, and bringing together information and media content. 25.70% of students have very good information and media literacy skills. Most students already have computers with various operating systems and mobile devices such as smartphones, iPods, tablets, and electronic dictionaries. Students consider it essential to improve their digital tools skills because it can enhance learning. It was concluded that the five components of the 5MIL learning model could be used so that students have the competencies needed for 21st-century life.

Keywords: Information And Media Literacy, Special Education, Learning

History:
Received : February 16, 2022
Revised : February 20, 2022
Accepted : March 28, 2022
Published : April 25, 2022

Publisher: Undiksha Press

1. INTRODUCTION

The rise of the internet and the emergence of new digital devices that provide quick and easy access to information have become an inseparable part of the daily life of today (Christianto, 2020; Mershad & Wakim, 2018). Digital generation, from simple activities such

as playing, and communicating with others, including finding information for academic purposes (Afif, 2019; Yefanov et al., 2020; Yildiz, 2020). In the learning environment, the internet and electronic information have become the major and important sources of information for lecturers and students in completing their academic tasks (Boyd, 2019; Hashim, 2018; Ronzhina et al., 2021). The research reported that for research purposes, lecturers and students prefer to use internet facilities such as search engines than other sources of information such as academic libraries or printed books (Bashir et al., 2016). The daily life of students that is inseparable from the internet and digital tools does not automatically enable them to use it effectively and efficiently (Chick et al., 2020; Phelps et al., 2021; Wahyuni et al., 2020). Other research found that students' level of mastery in using electronic information sources was still low and needed to be improved (Majid, S., Foo & Chang, 2020). Other research found that the majority of students still have low competence in all aspects of media and information literacy, including in analyzing information needs, accessing information effectively and efficiently, evaluating the appropriateness of the information, and using information effectively and efficiently (Klomsri & Tedre, 2016).

The low digital competence of students has become one of the most critical problems in this information age because the availability of information communication technology facilities cannot guarantee that users can easily access and use information technology effectively and efficiently (Nsama et al., 2020; Spante et al., 2018). This condition of course, has an impact on the low quality of information obtained by students (Chan et al., 2017; Zhao et al., 2021). In addition, the students' low understanding of the use of information ethically and legally will encourage plagiarism. Without sufficient knowledge about the ethics of using information, copy-pasting will become a common activity among students because they do not realize that plagiarism is a violation of intellectual rights. UNESCO has advocated for a set of competencies that citizens in the 21st century must have as a prerequisite for sustainable development (Fedorov & Mikhaleva, 2020; R. P. Rahayu & Wirza, 2020). This competency is referred to as media and information literacy, which is a set of competencies that empowers citizens to access, retrieve, understand, evaluate and use, to create and share information and media content in all formats, using various tools, in a critical, ethical and effective, in participating and engaging in personal, professional and social activities (Churchill, 2020; Sadhu & Wijayanti, 2018).

Information and media literacy is an important skill that not only forms the basis for lifelong learning but is also essential to the mission of higher education institutions (Latifah et al., 2019; Liu & Zhang, 2021). Information and media literacy helps develop individuals' intellectual abilities to think critically and enables them to learn how to learn (Chan et al., 2017; Churchill, 2020). Information and communication technology allows everyone to easily create and share various content or communicate important ideas to participate in the knowledge society, whether visual, textual, audio, or multimodal content through video, applications, and media (Atkin et al., 2015; Liao et al., 2021; Lynch et al., 2021). Websites, blogs, social networks, and others. For this reason, media and digital literacy skills are very important to enable individuals to be creative and communicate and create the knowledge needed to be shared with the wider community (Gretter & Yadav, 2016).

Several studies indicate that media and information literacy skills are part of critical thinking skills, help improve student writing skills and academic performance (Shao & Purpur, 2016), and are associated with higher levels of student academic motivation and self-efficacy (Ross et al., 2016), as well as those that help support other 21st century skills, such as life and career skills and learning and innovation skills. And most importantly, media and information literacy skills allow students to be able to connect in learning networks without barriers or restrictions (Khlaisang & Koraneekij, 2019). Media and information literacy skills enable individuals to be able to identify their information needs, identify sources of

information to meet those needs, extract information from reliable sources, and evaluate the information obtained (Churchill, 2020; Kivunja, 2015). Conversely, this lack of skills will cause difficulties in obtaining high-quality, valid, reliable, and up-to-date information, lack of access to information sources, inefficient in accessing information, and lack of a good understanding of packaging, using and sharing information ethically and legally (Omar & Davids, 2020).

The descriptions above provide a solid basis for placing information literacy skills into the curriculum to equip students with skills needed in higher education and the workplace of the future. The integration of media and information literacy skills into the curriculum is supported by many studies, including research conducted by (Adams et al., 2016). In addition, other research found that integrating information and media literacy into the regular curriculum can be applied in the context of learning in higher education, especially in the inquiry-based learning approaches (Chen et al., 2017). This study aims to develop a model for the integration of information and media literacy into the instruction of pre-service special education teachers teaching and learning. The application of this Model to learning is expected to equip students with a set of skills that enable them to be able to access, retrieve, understand, assist and use, create and share information and media content in all formats using a variety of tools, in critical ways, and others, and effective in order to be involved in personal, professional, and social activities.

2. METHODS

This research describes three of the five stages of research and development of instructional models for the integration of information and media literacy into instruction at the Pre-service Special Education Teachers Program of Jakarta State University, Indonesia. Researchers applied educational design research with the ADDIE approach (Analyze, Design, Develop, Implement, and Evaluation) (Wulandari et al., 2020). The needs analysis stage aims to produce a framework for the development of Model for the integration of information and media literacy into instruction. The design phase was concerned with developing a media and information skills-based learning model framework which consists of two steps, namely, designing specific instructional objectives and developing assessment instruments. The development phase is related to the development of product prototypes which consists of two main steps, namely, the development of instructional strategies and the development of instructional materials. The Need analysis phase involved 214 participants first year, second year, and third-year students of the Pre-service Special Education Teachers Program of Jakarta State University, Indonesia. The data were derived from a questionnaire and were analyzed quantitatively with rating scale format.

3. RESULTS AND DISCUSSION

Result

The results of this study are presented through the backdrop of five themes: Students' information and media literacy skills, Students' general characteristics, Frequencies of use of computer and smartphone applications, Students' attitude toward the use of digital tools, the development of the learning model. Based on the test results given to 214 respondents, it appeared that most students have excellent or good information and media literacy skill, both in recognizing the need to be able to search, access, and retrieve media information and content, understand, assess, and evaluate information and media, as well as create, utilize and monitor information and media content. Based on data analysis show that among 214 students, 55 students (25,70%) have an excellent level of information and media literacy

skills, 124 students (57,94) have a good level, and only 35 students (16.36%) of students have a low level of information and media literacy skills. The data illustrated that most of the students are familiar with using digital tools in their daily lives. The data in Table 1 shows the results of the analysis of student characteristics. Analysis of student characteristics is needed to determine decisions related to the development of the instructional Model. It includes individual characteristics, level of experience, and ownership of computers and digital tools.

Table 1. Students' general characteristics

Gender	**Female**	**83.64%**
	Male	**16.36%**
Age	18-20	64.95%
	21-23	33.18%
	24-26	1.87%
Average years of using computers	1-5	16.36%
	6-10	57.48%
	11-15	25.23%
	>15	0.93%
Type of computer owned	Desktop PC	5.61%
	Notebook	64.02%
	Desktop PC, Notebook	30.37%
Type of operatiing system used	Windows	95.79%
	MacOS	1.40%
	Windows, Linux	0.47%
	Windows, macOS	2.34%
Type of digital tools owned	Smartphone	94.39%
	Tablet	0.93%
	Smartphone, tablet	0.47%
	Smartphone, iPods	3.74%
	Smartphone, eelectronic dictionary	6.54%
	Smartphone, Pied, eelectronic dictionary	0.47%
	Others	0.47%

Table 1 shows that most of the respondents were female (83.64%) with an age range of 18-20 years, and spread from students in years two, four, six, and eight. Most of the students already know and learn to operate computers and digital devices. Since elementary school age. In addition, most of the students already own computers with various operating systems and mobile devices such as smartphones, iPods, tablets, and electronic dictionaries. Based on student responses related to the frequency of use of computer and smartphone applications for various learning needs, data was obtained, as shown in Table 2.

Tabel 2. Frequencies of use of computer and smartphone applications

	Always	**Often**	**Sometimes**	**Rarely**	**Never**
Word processing applications	64.95	32.24	2.80	0.00	0.00
Spreed Sheet applications	5.61	12.62	37.38	36.45	7.94
Presentation Applications	21.96	36.92	25.23	10.75	5.14
Graphic Applications	5.14	4.21	18.22	31.78	40.65
E-learning applications	28.50	42.52	15.42	6.54	7.01
Statistics applications	0.47	0.00	6.54	13.08	79.91

	Always	Often	Sometimes	Rarely	Never
Web Search Engines	64.95	20.56	4.21	2.34	7.94
E-mail	62.15	33.64	4.21	0.00	0.00
Translator applications	38.32	43.93	16.82	0.93	0.00
Blogs	4.67	21.03	34.58	25.70	14.02
Text Chat applications	83.18	14.95	0.93	0.93	0.00
Voice Chat applications	40.19	31.31	15.89	8.88	3.74
Video Chat applications	35.05	28.04	21.96	11.21	3.74
Conference applications	17.29	47.66	27.10	7.01	0.93
Web Video sharing	43.93	38.79	11.21	3.27	2.80

As shown in Table 2, chat applications are the most frequently used by students (83.18%) for learning purposes, followed by word processing (64.95%), Search Engines (64.95%), and Email (62.15%). Meanwhile, statistical applications, graphical applications, and blogs are the applications that are rarely used by students. Data in Table 3 illustrates the respondent's attitude towards the use of digital tools, especially for learning and learning purposes.

Table 3. Student's attitude toward the use of digital tools

	Strong agree	Agree	Neutral	Disagree	Strongly disagree
I enjoy using digital devices.	40.65	53.27	5.61	0.47	0.00
I feel comfortable using digital devices.	33.64	57.94	7.01	1.40	0.00
I am willing to learn more about digital technology.	35.05	50.93	11.68	0.47	0.47
I feel inferior when other people talk about digital technology.	9.35	32.24	36.92	19.16	2.34
I feel that I am lagging behind my peers in using technology.	16.36	25.70	27.57	28.04	2.34
I think it is important for me to increase the ability to operate digital tools	28.97	49.07	14.02	7.01	0.93
I think my learning can be improved by using digital tools and resources	24.77	63.08	10.75	1.40	0.00

As shown in Table 3, digital tools have become the most important part of the respondents' lives, where they enjoy and feel comfortable using digital tools in their daily lives. Most of the respondents considered that it is important for them to improve their skills using digital tools because it can enhance learning. Most of the students stated the need to incorporate digital tools into classroom teaching and learning. Referring to the UNESCO, Information and Media Literacy Indicators, the development of the learning model resulted in a series of instructional strategy stages that integrated information and media literacy skills into it. This Model consists of five main steps as visualized in Figure 1.

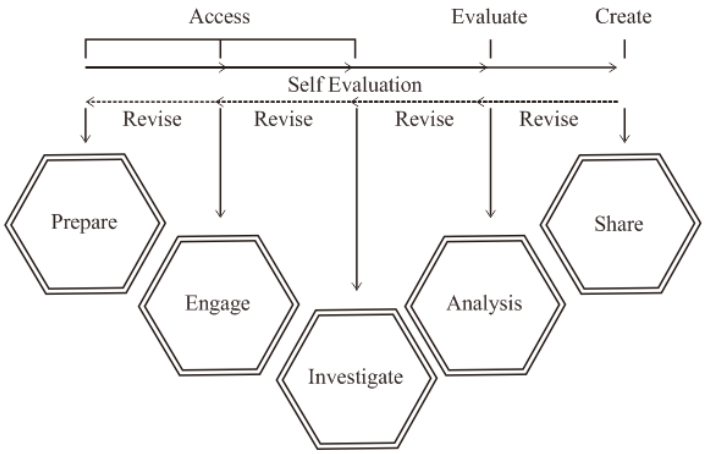

Figure 1. The 5MIL Model

The first stage of this Model, preparation, is preceded by steps in the form of apperception activity to determine the relevance of the knowledge that students already have with the assignment to be given; discuss learning objectives; provide an explanation and discuss the assignment topic to be given; describes the requirements of the task to articulate information needs. In the second step, engage, the lecturer forms discussion groups and guides students to formulate problems to be solved and the objectives of the investigation, and develop appropriate tools and strategies to find information in accordance with the topic to be investigated. The third stage, investigation, aims to teach students to be able to practice strategies and use digital tools to access information in an effective and efficient manner and select, read, and access information using appropriate technology and tools. At The fourth stage, analysis, the lecturer guides students to understand by analyzing the information obtained and assesses the quality of information, including the quality of intrinsic information, which refers to the fact that the quality of information has quality in itself, which consists of accuracy, objectivity, unreliability, and reputation; the quality of contextual information, namely that the quality of information must be taken into account in the context of the task at hand, including relevance, added value, timeliness, completeness, and the amount of data it has involves requirements; accessibility quality, including dimensions access and security; and representational qualities, including interpretability, consistency, conciseness, and appropriateness. Next, the lecturer guides students to organize information by linking pieces of information with each other to build information. This step aims to make it easier for students to gain new understanding and knowledge to solve the problems faced by them.

The fifth stage of the Model, create, aims to enable students to create new knowledge from the information they have obtained and share it using various formats and tools. At this stage, the lecturer guides students to analyze, synthesize, and conclude the information that has been obtained and grouped. This step aims to encourage students to be able to create knowledge and creative expression in accordance with the objectives of the assignment. In this step, lecturers must encourage students to be able to communicate the new pieces of knowledge that have been obtained and share them legally and ethically using the right media and in the right format as a form of student participation as active citizens and to monitor the influence of information published on portals where the results of assignments are published. The Model is equipped with a self-evaluation component, namely self-reflection activities that take place throughout learning to measure whether the quality of student assignments is in accordance with the objectives of the assignment, both the process and the results. The self-evaluation component of this learning model is a critical thinking application that must

be continuously carried out to assess the adequacy of student learning outcomes and processes. Related to this component, lecturers must ensure students are able to reflect on their performance through learning experiences and check this performance systematically during instruction. Lecturers can provide guides and suggestions for improvement so that students do what is needed to improve learning processes and products.

Discussion

Needs analysis is needed to facilitate the learning and design development steps needed to produce the necessary teaching resources and systems (Alodwan & Almosa, 2018; Jones et al., 2018; Riyanto et al., 2020). Thus, data resulting from the needs analysis stage of this research are needed to guide determining the material, delivery methods, and appropriate assessment formats for the learning model to be developed. The needs analysis stage provided useful information to identify factors that might hinder the learning process and provide useful information for determining instructional methods and strategies that are appropriate to students' characteristics (Fakhruddin et al., 2019; Rosalina & Suhardi, 2020; Swestyani et al., 2018).

This study found that as a generation that has been born digital, most students have made digital tools a part of their daily lives. This is evidenced by the ownership of digital tools used to help improve learning, such as computers/laptops and mobile devices such as smartphones, iPods, and tablets. Students' daily lives that cannot be separated in digital tools can also be seen from the ability of students to independently learn to operate new digital tools and run applications commonly used in learning and access information, such as word processing applications, number processing, search engines, email, etc (Boyd, 2019; Phelps et al., 2021; Wahyuni et al., 2020). In addition, the students' attitude towards the use of digital tools, where they enjoy and feel comfortable using digital tools to improve their learning become a strong reason for placing technology tools as part of teaching and learning in the Pre-service (Cai et al., 2020; Chan et al., 2017; Suyasa et al., 2021). Special Education Teachers Program of Jakarta State University. Referring to the UNESCO information and media literacy skills indicator, which is a set of competencies that citizens must have in the 21st century and as a prerequisite for sustainable development, the developed instructional Model is expected to encourage the empowerment of students as skilled citizens to access, take, understand, evaluate and use, to create and share media information and content in all formats, use a variety of tools, in critical, ethical and effective ways, to participate and engage in personal, professional and social activities.

The five components of the learning model that integrate information and media into learning developed in this study combine the concepts of media literacy and information literacy with other literacy concepts, such as ICT literacy and digital literacy, which are then used to develop a set of competencies needed in a technological environment for the students to have the competencies necessary for the life of the 21st century, especially their need to handle the enormous volume of data, information and media messages originating from various communication platforms and providers and communication and information platforms. An important component of this information and media literacy-based learning model is the existence of self-evaluation activities at each stage, where students can assess the extent to which they meet the assignment performance standards (Cahyani & Jayanta, 2021; Hadiyanti et al., 2021; T. Rahayu et al., 2019). In addition, through this self-evaluation activity, students have the opportunity to assess their efforts and the results they get, so it is hoped that in the next sessions, they can be more effective in completing their next lecture assignments (Alla Belousova, 2015; Hill et al., 2020). Other research that media and information literacy skills are part of critical thinking skills, and can help improve student writing skills and academic performance (Churchill, 2020; Kivunja, 2015; Yildiz, 2020).

Integrating information and media literacy skills into teaching and learning not only equips students with the skills needed in higher education but also in the world of work in the future (Adams et al., 2016).

Nonetheless, this research is subject to several limitations that have been stated to the paper's intention. First, the result of the study only provides the Model of integration media and information literacy for pre-service special education teachers, but the effectiveness of the model has not been proven yet. This paper was conducted to acquire a model for media and information literacy skills for pre-service special education teachers, which are surrounded by abundant sources of information in media. Second, this research is biased on a special education major scale, which means this Model was constructed on the need analysis of special education pre-service students. The implication can only be tested in a pre-service special education program. For further research, it had been better if the Model has been implied, so there is a chance to evaluate and analyze the deficiency. Not to mention, the analysis from the 1st Model can be integrated to widen the range of sample and definitely reach the impact. The Model of integrated media and information literacy for pre-service special education teachers teaching and learning is recommended for developing their competencies in the 21st century. This research has high potency in developing media and information literacy skills for pre-service teachers.

4. CONCLUSION

Digital tools had become a part of students' daily lives where they enjoy and feel comfortable using them to enhance learning. There is a strong need for placing technology tools as part of teaching and learning in the Pre-service Special Education Teachers Program of Jakarta State University. The five components of The 5MIL Model of instruction develop a set of competencies needed in a technological environment, in order for students to have the competencies necessary for the life of the 21st century, especially their need to handle the enormous volume of data, information, and media. Thus, it is recommended to validate the Model through formative evaluation stages to be implemented in the institution.

5. REFERENCES

Adams, C., Buetow, S., Edlin, R., Zdravkovic, N., & Heyligers, J. (2016). A collaborative approach to integrating Information and Academic Literacy into the Curricula of Research Methods Courses. *The Journal of Academic Librarianship*, *42*(3). https://doi.org/10.1016/j.acalib.2016.02.010.

Afif, N. (2019). Pengajaran dan Pembelajaran di Era Digital. *IQ (Ilmu Al-Qur'an): Jurnal Pendidikan Islam*, *2*(01), 117–129. https://doi.org/10.37542/iq.v2i01.28.

Alla Belousova, V. P. (2015). Technique of Thinking Style Evaluating. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE)*, *3*(2), 1–8. https://doi.org/10.23947/2334-8496-2015-3-2-1-8.

Alodwan, T., & Almosa, M. (2018). The Effect of a Computer Program Based on Analysis, Design, Development, Implementation and Evaluation (ADDIE) in Improving Ninth Graders' Listening and Reading Comprehension Skills in English in Jordan. *English Language Teaching*, *11*(4), 43. https://doi.org/10.5539/elt.v11n4p43.

Atkin, D. J., Hunt, D. S., & Lin, C. A. (2015). Diffusion Theory in the New Media Environment: Toward an Integrated Technology Adoption Model. *Mass Communication and Society*, *18*(5), 623–650. https://doi.org/10.1080/15205436.2015.1066014.

Bashir, S., Mahmood, K., & Shafique, F. (2016). Internet use among university students: a survey in University of the Punjab, Lahore. *Journal of Information Management and Libraries*, *9*(1). https://doi.org/10.47657/20089811.

Boyd, L. (2019). Using Technology-Enabled Learning Networks to Drive Module Improvements in the UK OpenUniversity. *Journal of Interactive Media in Education*, *2019*(1), 1–7. https://doi.org/10.5334/jime.529.

Cahyani, N. L. P., & Jayanta, I. N. L. (2021). Digital Literacy-Based Learning Video on the Topic of Natural Resources and Technology for Grade IV Elementary School. *Jurnal Ilmiah Sekolah Dasar*, *5*(3), 538. https://doi.org/10.23887/jisd.v5i3.37918.

Cai, S., Liu, E., Shen, Y., Liu, C., Li, S., & Shen, Y. (2020). Probability learning in mathematics using augmented reality: impact on student's learning gains and attitudes. *Interactive Learning Environments*, *28*(5), 560–573. https://doi.org/10.1080/10494820.2019.1696839.

Chan, B. S. K., Churchill, D., & Chiu, T. K. F. (2017). Digital Literacy Learning in Higher Education through Digital Storytelling Approach. *Journal of International Education Research (JIER)*, *13*(1), 1–16. https://doi.org/10.19030/jier.v13i1.9907.

Chen, L. C., Chen, Y. H., & Ma, W. I. (2017). Effects of integrated information literacy on science learning and problem-solving among seventh-grade students. *Malaysian Journal of Library & Information Science*, *19*(2).

Chick, R. C., Clifton, G. T., Peace, K. M., Propper, B. W., Hale, D. F., Alseidi, A. A., & Vreeland, T. J. (2020). Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *Journal of Surgical Education*, *77*(4), 729–732. https://doi.org/10.1016/j.jsurg.2020.03.018.

Christianto, H. (2020). Penggunaan Media Internet Dalam Pemenuhan Hak Atas Pendidikan Di Masa Pandemi Covid-19 : Perspektif Hak Asasi Manusia Dan Hukum Pidana. *HAM*, *11*(2), 239–253. https://doi.org/10.30641/ham.2020.11.239-253.

Churchill, N. (2020). Development of Students' Digital Literacy Skills through Digital Storytelling with Mobile Devices. *Educational Media International*, *57*(3), 271–284. https://doi.org/10.1080/09523987.2020.1833680.

Fakhruddin, Z., Amzah, A., & Nurchalis, N. F. (2019). Technology-Based Teaching Material Development Training for Pre-Service Teachers to Improve Students' Learning Outcomes. *NOBEL: Journal of Literature and Language Teaching*, *10*(1), 87–102. https://doi.org/10.15642/nobel.2019.10.1.87-102.

Fedorov, A., & Mikhaleva, G. (2020). Current Trends in Media and Information Literacy in Research and Scientific Publications of the early 21 st century. *International Journal of Media and Information Literacy*, *5*. https://doi.org/10.13187/ijmil.2020.2.153.

Gretter, S., & Yadav, A. (2016). Computational thinking and media & information literacy: An integrated approach to teaching twenty-first century skills. *TechTrends*, *60*(5). https://doi.org/10.1007/s11528-016-0098-4.

Hadiyanti, N. F. D., Hobri, Prihandoko, A. C., Susanto, Murtikusuma, R. P., Khasanah, N., & Maharani, P. (2021). Development of mathematics e-module with STEM-collaborative project based learning to improve mathematical literacy ability of vocational high school students. *Journal of Physics: Conference Series*, *1839*(1). https://doi.org/10.1088/1742-6596/1839/1/012031.

Hashim, H. (2018). Application of Technology in the Digital Era Education. *International Journal of Research in Counseling and Education*, *1*(2), 1. https://doi.org/10.24036/002za0002.

Hill, M., Peters, M., Salvaggio, M., Vinnedge, J., & Darden, A. (2020). Implementation and evaluation of a self-directed learning activity for first-year medical students. *Medical Education Online*, *25*(1), 1–10. https://doi.org/10.1080/10872981.2020.1717780.

Jones, C., Fraser, J., & Randall, S. (2018). The evaluation of a home-based paediatric nursing service: concept and design development using the Kirkpatrick model. *Journal of Research in Nursing*, *23*(6), 492–501. https://doi.org/10.1177/1744987118786019.

Khlaisang, J., & Koraneekij, P. (2019). Open online assessment management system platform and instrument to enhance the information, media, and ICT literacy skills of 21st century learners. *International Journal of Emerging Technologies in Learning (IJET)*, *14*(7). https://doi.org/10.3991/ijet.v14i07.9953.

Kivunja, C. (2015). Unpacking the Information, Media, and Technology Skills Domain of the New Learning Paradigm. *International Journal of Higher Education*, *4*(1). https://doi.org/10.5430/ijhe.v4n1p166.

Klomsri, T., & Tedre, M. (2016). Poor information literacy skills and practices as barriers to academic performance: A mixed methods study of the University of Dar es Salaam. *Reference & User Services Quarterly*, *55*(4). https://doi.org/10.5860/rusq.55n4.293.

Latifah, S., Susilowati, N. E., Khoiriyah, K., Saidy, S., Yuberti, Y., & Rahayu, R. (2019). Self-Efficacy: Its Correlation to the Scientific-Literacy of Prospective Physics Teacher. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1155/1/012015.

Liao, Y.-C., Ottenbreit-Leftwich, A., Glazewski, K., & Karlin, M. (2021). Coaching to support teacher technology integration in elementary classrooms: A multiple case study. *Teaching and Teacher Education*, *104*, 103384. https://doi.org/10.1016/j.tate.2021.103384.

Liu, L., & Zhang, H. (2021). Financial literacy, self-efficacy and risky credit behavior among college students: Evidence from online consumer credit. *Journal of Behavioral and Experimental Finance*, *32*. https://doi.org/10.1016/j.jbef.2021.100569.

Lynch, M., Sage, T., Hitchcock, L. I., & Sage, M. (2021). A heutagogical approach for the assessment of Internet Communication Technology (ICT) assignments in higher education. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00290-x.

Majid, S., Foo, S., & Chang, Y. K. (2020). Appraising information literacy skills of students in Singapore. *Aslib Journal of Information Management*, *72*(3). https://doi.org/10.1108/AJIM-01-2020-0006/full/html.

Mershad, K., & Wakim, P. (2018). A Learning Management System Enhanced with Internet of Things Applications. *Journal of Education and Learning*, *7*(3), 23. https://doi.org/10.5539/jel.v7n3p23.

Nsama, P., Masaiti, G., & Akakandelwa, A. (2020). Availability and Usage of Information Communication Technology Facilities in Secondary Schools in Zambia. *Zambian Journal of Educational Management, Administration and Leadership (ZJEMAL)*, *1*(1).

Omar, Y., & Davids, Z. (2020). Perspectives of first-year Business Studies students on the Certificate of Information Literacy: a case study of the Cape Peninsula University of Technology. *South African Journal of Libraries and Information Science*, *86*(2).

Phelps, A., Colburn, J., Hodges, M., & Hodges, M. (2021). A qualitative exploration of technology use among preservice physical education teachers in a secondary methods course. *Teaching and Teacher Education*, *105*. https://doi.org/10.1016/j.tate.2021.103400.

Rahayu, R. P., & Wirza, Y. (2020). Teachers' Perception of Online Learning during Pandemic Covid-19. *Jurnal Penelitian Pendidikan*, *20*(3), 392–406. https://doi.org/10.17509/jpp.v20i3.29226.

Rahayu, T., Mayasari, T., & Huriawati, F. (2019). Pengembangan Media Website Hybrid Learning berbasis Kemampuan Literasi Digital dalam Pembelajaran Fisika. *Jurnal Pendidikan Fisika*, *7*(1), 130–142. https://doi.org/10.24127/jpf.v7i1.1567.

Riyanto, R., Amin, M., Suwono, H., & Lestari, U. (2020). The New Face of Digital Books in Genetic Learning: A Preliminary Development Study for Students' Critical Thinking. *International Journal of Emerging Technologies in Learning (IJET)*, *15*(10), 175. https://doi.org/10.3991/ijet.v15i10.14321.

Ronzhina, N., Kondyurina, I., Voronina, A., Igishev, K., & Loginova, N. (2021). Digitalization of Modern Education: Problems and Solutions. *International Journal of Emerging Technologies in Learning*, *16*(4), 122–135. https://doi.org/10.3991/ijet.v16i04.18203.

Rosalina, S. S., & Suhardi, A. (2020). Need Analysis of Interactive Multimedia Development With Contextual Approach on Pollution Material. *INSECTA: Integrative Science Education and Teaching Activity Journal*, *1*(1), 93. https://doi.org/10.21154/insecta.v1i1.2107.

Ross, M., Perkins, H., & Bodey, K. (2016). Academic motivation and information literacy self-efficacy: The importance of a simple desire to know. *Library & Information Science Research*, *38*(1). https://doi.org/10.1016/j.lisr.2016.01.002.

Sadhu, S., & Wijayanti, E. (2018). Development and Validation of an Integrated Assessment for Measuring Critical Thinking and Chemical Literacy in Chemical Equilibrium. *International Journal of Instruction*, *11*(3), 557–572. https://doi.org/10.12973/iji.2018.11338a.

Shao, X., & Purpur, G. (2016). Effects of information literacy skills on student writing and course performance. *The Journal of Academic Librarianship*, *42*(6). https://doi.org/10.1016/j.acalib.2016.08.006.

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital Competence and Digital Literacy in Higher Education Research: Systematic Review of Concept Use. *Cogent Education*, *5*(1), 1–21. https://doi.org/10.1080/2331186X.2018.1519143.

Suyasa, P. W. A., Divayana, D. G. H., & Kristiantari, M. R. (2021). The effect of digital books based on kvisoft flipbook maker on student learning outcomes. *Journal of Physics: Conference Series*, *1810*(1), 012046. https://doi.org/10.1088/1742-6596/1810/1/012046.

Swestyani, S., Masykuri, M., Prayitno, B., Rinanto, Y., & Widoretno, S. (2018). An analysis of logical thinking using mind mapping. *Journal of Physics: Conference Series Paper*. https://doi.org/10.1088/1742-6596/1022/1/012020.

Wahyuni, S., Reswita, & Afidah, M. (2020). Pengembangan Model Pembelajaran Sains , Technology , Art , Engineering And Mathemathic Pada Kurikulum PAUD. *Jurnal Golden Age, Universitas Hamzanwadi*, *04*(2), 297–309. https://doi.org/10.29408/goldenage.v4i02.2441.

Wulandari, I. G. A. A. M., Sudatha, I. G. W., & Simamora, A. H. (2020). Pengembangan Pembelajaran Blended Pada Mata Kuliah Ahara Yoga Semester II di IHDN Denpasar. *Jurnal Edutech Undiksha*, *8*(1), 1. https://doi.org/10.23887/jeu.v8i1.26459.

Yefanov, A. A., Budanova, M. A., & Yudina, E. N. (2020). Digital literacy of schoolchildren and teachers: A comparative analysis. *RUDN Journal of Sociology*. https://doi.org/10.22363/2313-2272-2020-20-2-382-393.

Yildiz, E. P. (2020). Opinions of academicians on digital literacy: A phenomenology study. *Cypriot Journal of Educational Sciences*. https://doi.org/10.18844/cjes.v15i3.4913.

Zhao, Y., Llorente, A. M. P., & Gómez, M. C. S. (2021). Digital competence in higher education research: A systematic literature reviewNo Title. *Computers & Education*, *168*. https://doi.org/10.1016/j.compedu.2021.104212.