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Article

Exploring the effect of pre-service teachers' digital competence on paperless behavior

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Abstract: Pre-service teachers must implement paperless behavior in line with institutional policies, technological developments, and environmentally friendly issues. Pre-service teacher candidates are expected to have digital competence in skills, abilities, and knowledge to successfully use computers, their related applications, and software in teaching and educational practice. It is predicted to affect their paperless behavior because digital activities reduce paper use. This study aimed to analyze the influence of prospective teachers' digital competencies on their paperless behavior. The research is based on the theory of planned behavior (TPB) using a quantitative approach and involved 372 pre-service teachers at the Faculty of Economics, Universitas Negeri Semarang (UNNES). Sampling was done by purposive sampling with specific criteria. The results of the study show that digital competence has an influence on paperless behavior by 43.1%. These findings add insight into the role of digital competence in an environmentally friendly learning process. This research suggests increasing students' digital competence so that students' paperless behavior rises in line with environmental issues.

Keywords: paperless behavior; digital competence; theory of planned behavior (TPB)

1. Introduction

The application of information and communication technology in various aspects of life is widely used because it is easy, practical, fast, and cost-effective [1]. This convenience unknowingly causes a positive impact, namely reducing paper use. The system is called paperless, which is currently widely applied by teachers or lecturers. One of its applications is using electronic portfolios in learning evaluation [2]. Paperless behavior is one of the efforts to decrease environmental destruction. Paperless behavior is essential to apply to teacher candidates in line with institutional policies, technological developments, and environmentally friendly issues. Paperless can support lectures by applying the optimization of information technology-based systems in assessment. Prospective teachers are expected to have digital competence in skills, abilities, and knowledge to successfully use computers, related applications, and software in teaching and educational practice. It is predicted to impact paperless behavior because digital activity reduces paper usage.

The application of information and communication technology can improve paperless behavior. With advances in existing technology, it can be easier for users to use technology such as computers. So prospective teachers are expected to have digital competence in the form of skills and abilities in using computers.

Paperless behavior at Universitas Negeri Semarang (UNNES) is still not optimal because many student assignments use paper. Ideally, student assignments

can be submitted via email or using other digital systems, which can reduce paper usage. Tusyanah et al. [3] recommended that UNNES students increase pro-environmental behavior through a paperless policy. In 2012, UNNES confirmed its intention to become an international conservation university. Conservation University is a university in the implementation of education, research, and community service that has a concept that refers to conservation principles such as protection, preservation, and sustainable use. One of the policies to become a conservation university is that UNNES enforces regulations paperless policy, which is stated in Regulation of the Chancellor of Universitas Negeri Semarang Number 27 of 2012 in the seven pillars of conservation.

Digital technology in the industrial era 4.0 has developed rapidly and has brought changes so that it dramatically affects various aspects of human life, including in the field of education, as stated by Tusyanah et al. [3]. So digital technology dramatically influences the digital aspect because technology has developed rapidly and is easy to use. Students are required to be able to use digital technology due to the rapid development of this technology. On the other hand, education will feel easy if it is related to technology, as we can access or search on "Google", everything is there. With that convenience, it needs to be utilized in terms of learning.

Previous research in this study was the implementation of the use of digital learning media during the COVID-19 pandemic, which explained that learning using technology needed to be used because, during COVID-19, students and teachers could not meet, as stated by Tusyanah et al. [3]. Research conducted by Reza et al. [4] with the title, "Based archive management training paperless office and making a monograph" explains that paperless in order to get used to processing and reading documents in digital form, in other words, reducing the use of paper as the primary material for document writing.

Behavioral research relies heavily on the theory of planned behavior (TPB) as the basis for looking for predictors of behavior derived from attitudes, subjective norms, and perceived behavioral control. These three things affect intention, which then influences behavior. Pro-environmental behavior is a practice that promotes resource protection and conservation practices and supports sustainable use of the natural environment, as stated by Lee and Kotler [5]. Conservation behavior is concrete action taken by conservative-minded humans to preserve the environment to maintain the use of natural resources (in this study, paper from trees) for present and future generations.

It can be interpreted that paperless behavior can be measured because it is done consciously by individuals and follows predictors, as stated by Ajzen [6]. Behavior is determined by a belief about whether a person has access to the necessary resources and opportunities to perform successful behavior, balanced by the perceived strength of each factor, as stated by Boar [7]. Behavior means response or reaction to stimuli. Behavior is an action or deed of an organism that can be observed and learned[8].

This study aims to analyze the effect of digital competence on paperless behavior among pre-service teachers. The aim of this study follows in the footsteps of previous research, which adopted a definition in which digital competence is focused on the skills and abilities of learners to perform certain tasks on or with

digital computers related to their specific tasks. content area domains Kletke et al., and Ballantine et al. [9,10]. Digital competence is defined and limited to having the skills, abilities, and knowledge to successfully use computers, their related applications, and software in teaching and educational practice.

2. Methods

It is quantitative research with descriptive statistics and simple regression with the Statistical Program for Social Science (SPSS). The following is an operational definition and indicators for making this research questionnaire. The questionnaires are distributed to the respondents. The questionnaires are made based on the definitions and indicators of variables as shown in **Table 1**.

Table 1. Definitions and indicators of the variables.

Variables	Definitions	Indicators	Sources
Paperless behavior	Paperless behavior is a natural action that can be observed and closely related to the management of paper use by humans in a sustainable manner for present and future generations [8].	1) Duration 2) Frequency	Kletke et al. [9], Ajzen [6]
Digital competence	It is skills, abilities, and knowledge to successfully use computers, their related applications, and software in teaching and educational practice.	1) General computer literacy Email/internet 2) Resentation software 3) Spreadsheets 4) Word-processing 5) Design graphic 6) Web 2.0 7) Database management 8) Technological Awareness	Evangelinos and Holley [11]

There are three study programs in the Faculty of Economics, UNNES. The respondents were taken from the population as shown in **Table 2**. Furthermore, the following is the population and sample in this study involving pre-service teachers.

Table 2. The population and samples [12].

The study programs	Students
Office administration education	106
Accounting education	159
Economics education	107
Total	**372**

The population in this study were all active students of Economics Education at UNNES in 2020, totaling 372 students. One hundred ninety-three samples were taken using a proportional random sampling technique based on this population. Data were collected by distributing questionnaires. The analytical method used is simple regression with SPSS.

As we understand it, digital competence refers to the ability to use digital technologies effectively and responsibly. When it comes to paperless behavior, digital competence plays a crucial role in shaping individuals' attitudes and actions. People with digital competence understand how to leverage technology for tasks that

traditionally involve paper. This understanding encourages them to adopt paperless solutions in their personal and professional lives. Hill et al. [13] stated that digital competence positively influences paperless behavior by fostering a deeper understanding of digital tools, encouraging environmental consciousness, improving efficiency, and facilitating effective education and awareness initiatives. As individuals become more digitally competent, they are likely to contribute to a broader cultural shift toward paperless practice (Hypothesis), as seen in **Figure 1**.

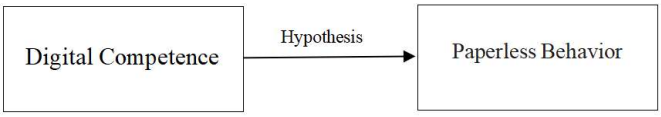

Figure 1. Research framework.

3. Results and discussion

3.1. Result

Before analyzing the regression model, we analyze descriptive statistics that allow us to approximate the reality of the sample of subjects being analyzed. The collected responses are based on indicators used to measure mental competence. The results show that the level of digital competence is determined by the average score based on a Likert scale of 1–4. The low-level indicator found in this study is the mastery of presentation software and spreadsheets, which deserves attention because it is the lowest of the seven indicators conceptualized. In contrast, the highest indicators are technology awareness and Web 2, the highest form of digital competency in research subjects. The best results were obtained for these two indicators, although the indicators still have not reached the ideal average value. The descriptive statistics can be seen in **Table 3**.

Table 3. Descriptive statistics analysis.

Indicators	*N*	Minimum	Maximum	Mean	Std. deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
General_computer_literacy	372	9	20	16.44	2.138
e_mail_Internet	372	8	16	13.46	1.839
Presentation_software	372	4	12	10.57	1.564
Spreadsheets	372	4	16	11.24	2.471
Word_processing	372	8	16	13.53	1.788
Web_2.0	372	9	24	19.14	3.467
Video_maker	372	7	16	12.31	2.219
Databases	372	8	24	15.85	3.168
Technology_awareness	372	14	28	25.15	2.986
Design_graphic	372	7	16	12.35	2.279
Valid N (listwise)	372	-	-	-	-

Upon scrutinizing the results of descriptive statistics, it became evident that out of the nine digital competency indicators examined, four indicators registered low

proficiency levels. Specifically, proficiency in presentation software, spreadsheets, video makers, and graphic designs lagged behind, despite the increasing significance of these skills in future contexts. Recognizing the critical role these indicators play in contemporary and future digital landscapes, there is a clear imperative to enhance proficiency in these areas. Addressing the skills gap in these four indicators becomes essential to ensuring individuals are well-equipped to navigate and contribute effectively in an increasingly digital-centric environment. Consequently, efforts should be directed toward targeted improvement strategies and training programs to elevate proficiency levels in presentation software, spreadsheets, video makers, and graphic designs. This proactive approach will not only benefit individuals but also contribute to their readiness for evolving technological demands.

After tabulating the data, the subsequent step involves conducting regression analysis, the findings of which are detailed in **Table 4**. Regression analysis is employed to examine and quantify the relationships between variables, allowing for a comprehensive understanding of the patterns and trends within the dataset. In this context, regression serves as a statistical tool to model the connections between the variables under investigation, providing insights into the nature and strength of their associations.

Table 4. Simple regression equation test results.

Coefficients						
Model		**Unstandardized coefficients**		**Standardized coefficients**	***t***	**Sig.**
		B	**Std. error**	**Beta**		
1	(Constant)	3.487	0.605	-	5.766	0.000
	Digital_competence	0.400	0.024	0.656	16.737	0.000
a. Dependent variable: Paperless_behavior						

The SPSS coefficient output shows the partial effect of the independent variable on the dependent variable. In the digital competence perception variable, a calculated value of 16.737 is obtained, and sig. 0.000 is less than 0.05. This means digital competence has a positive and significant influence on paperless behavior. The following is a simple regression equation from this study:

$$Y(\text{PB}) = 3.487 + 0.400\text{DC} + \text{e}$$

From this equation, it can be interpreted that an increase follows every increase of one unit of digital competence towards paperless behavior of 0.400. Furthermore, to determine the percentage of *X*'s influence on *Y*1; then the *R*2 test was carried out, and the results are shown in **Table 5**.

Table 5. Model summary.

Model	***R***	***R* square**	**Adjusted *R* square**	**Std. error of the estimate**
1	0.656[a]	0.431	0.429	1.373
a. Predictors: (constant), digital_competence				

The SPSS output above shows the contribution of digital competence with an *R*-square value of 0.327. This means that digital competence can influence the

paperless behavior-dependent variable by 43.1%. Furthermore, 56.9% is influenced by other factors outside the regression model.

3.2. Discussion

Paperless behavior is an indicator of concern for the environment. This behavior needs to be improved because excessive paper use can damage the environment. There is environmental damage due to the uncontrolled logging of trees used as raw materials for making paper [14]. Data shows that 65–97 million trees were cut down to meet the needs of paper production [15].

In light of the critical need to safeguard our natural resources for both current and future generations, the adoption of conservation behavior becomes imperative. Equally important is the preservation of our cultural heritage, exemplified by a genuine appreciation for and commitment to the practices of our local culture. Conservation behavior, as defined by Retnoningsih et al. [8], encompasses tangible actions that are observable and scrutinizable, specifically in the context of the sustainable management of human use of natural resources.

Furthermore, pro-environmental behavior stands out as a proactive approach that advocates for the protection of resources, the implementation of conservation practices, and the promotion of sustainable use within our natural environment [5]. This involves a conscious effort to align individual actions with practices that contribute to the overall well-being of the environment.

In essence, the concept of conservation behavior reflects the tangible efforts made by environmentally conscious individuals who possess a conservationist mindset. Their actions are geared towards environmental preservation, with the overarching objective of ensuring the sustainable use of natural resources for both present and future generations. By recognizing the significance of these behaviors, we contribute to a collective effort to address environmental challenges and work towards a more sustainable and harmonious coexistence with our planet.

The sustainability of the Earth with thriving forests not only enhances human life by providing clean and oxygen-rich air but also plays a crucial role in supporting human existence as a whole. In this context, some individuals have proposed the concept of a paperless office. This concept not only reflects environmental consciousness but also holds the potential to reduce the negative impact of office activities on forests and other natural resources. By adopting this approach, we are not only nurturing the current quality of life but also investing in a sustainable future, fostering a balanced coexistence between humans and the environment. As for the benefits, there is a system called a paperless classroom; that is, it can save time, and resources, be environmentally friendly, save space, improve the organization, and ensure that documents are safe. Paperless is an effort to reduce the negative impact of environmental damage, as stated by Irawan [16].

Paperless is an environmentally friendly concept for a university/college. Some paperless components that must be applied are soft documents, online documents, and electronic documents. Human behavior is an activity that can be measured and can be planned. Someone will do something, starting with intention. Furthermore, this intention is influenced by the individual's attitude, knowledge, and competence.

The TPB, which was coined by Ajzen [6], states that "the TPB states that behavioral achievement depends on both motivation (intention) and ability (behavioral control). It distinguishes between three types of beliefs—behavioral, normative, and control."

As prospective teachers who realize the importance of maintaining a green environment, it is necessary to provide knowledge and competence to reduce the use of paper. Especially nowadays, along with the development of the Industrial Revolution 4.0 era and changes in human activities where almost all activities can be done online, digital competence needs to be improved, as stated by Prasetyo and Trisyanti [17].

A teacher must be able to use the Internet for teaching, as stated by Suharmanto [18]. The Internet can be used as a learning medium so that the teaching and learning process can be carried out effectively and efficiently. Using the Internet as a learning medium can make it easier for teachers to get or convey information related to messages or content and learning materials, making it easier for teachers to carry out the teaching and learning process for students. The teacher needs digital aspects for precise and accurate information supporting the learning process, as stated by Silvana et al. [19]. Digital competence in this study is digital competence in the form of skills, abilities, and knowledge to successfully use computers, their related applications, and software in teaching and educational practice. It is, of course, different from digital competence for prospective doctors, prospective judges, or other professions.

Digital competence in this study uses indicators that contribute to teaching, including general computer literacy, email/Internet, presentation software, spreadsheets, word processing, graphic design, Web 2.0, database management, and technological awareness. From the results of this study, it was found that digital competence had a positive and significant effect on paperless behavior. It is appropriate grand theory TPB, which states that behavior is influenced by one of the attitudes, and knowledge, skills, social conditions, and individual personality influence this attitude.

It is also following research from Astuti and Setiawan [20], entitled, "Fostering teachers' digital competencies and innovative work behavior in facing Merdeka Belajar policy: Digital informal learning as a mediator," which states that digital competence has a positive and significant effect on learning digital information and innovative work behavior.

Also, research from Umaima and Hutabarat [21] entitled, "Bekasi Regency workforce readiness to work in the paperless office" states that digital competency and digital usage behavior have a significant effect on the readiness of the workforce in Bekasi Regency to work paperless. Also, research from Ratnaningsih [22] states that personality influences behavioral intentions to use paperless information technology systems, personality variables consisting of agreeableness and extraversion are positively and significantly related to behavioral intention (intention).

It indicates that prospective teachers must also improve their digital competence to be paperless. Teachers have a strategic role in reducing the need for paper because they are role models for their students to maintain a green environment. One of the factors that can influence students to play a role in maintaining a green environment

is the teacher. The teacher plays a role in instilling the character of caring for the environment in students, which refers to every attitude and action taken at school, as stated by Rosela and Gunansyah [23].

4. Conclusion

This study concludes that digital competence positively and significantly affects paperless behavior. The better the digital competence, the better the paperless behavior because individuals reduce the use of paper and can utilize technology for the teaching needs of prospective teachers. It suggests that pre-service teachers should adapt and integrate technology into their learning, which in the end reduces the use of paper.

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References

1. Sudiksa IM, Divayana DGH, Warpala WS. The effect of e-learning and campus environment on student interest in learning with learning motivation as a mediating variable (Indonesian). J. Teknol. Pembelajaran Indones 2020; 10(2): 86-97.
2. Utari E, Mahrawi M, Gumanti RM. Analysis of online learning as an effort towards paperless policy in FKIP Campus, Sultan Ageng Tirtayasa University (Indonesian). Jurnal Biologi Babasal 2022; 1(1). doi: 10.32529/jbb.v1i1.1663
3. Tusyanah T, Ismiyati I, suryanto E, et al. Does green space signify on students' academic performance and pro-environmental behavior? An empirical study at a pro-environmental university. Journal of STEAM Education 2023; 6(1): 84-100. doi: 10.55290/steam.1149958
4. Reza HK, Susanti M, Karim K, et al. Training on paperless office-based archive organization and monograph making (Indonesian). J. Res. Business, Econ. Educ.2021; 3(2): 1767-1774.
5. Lee NR, Kotler P. Social Marketing: Influencing Behaviors for Good. SAGE publications; 2011.
6. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes 1991; 50(2): 179-211. doi: 10.1016/0749-5978(91)90020-t
7. Boar BH. Attitudes, Personality, and Behavior. The Dorsey Press, Chicago; 1999.
8. Retnoningsih A, Saratri W, Dewi LS, et al. Three Pillars Conservation Education ((Indonesian). UNNES Press, Semarang; 2018.
9. Kletke M, van Vliet P, Schroeder D. Self-assessment instruments and objective testing instruments for evaluating levels of expertise among microcomputer end users: Is there a measurable relationship between the two. In: Proceedings of the 23rd Annual Meeting of the Decision Sciences Institute; 1992; San Francisco, CA.
10. Ballantine JA, McCourt Larres P, Oyelere P. Computer usage and the validity of self-assessed computer competence among first-year business students. Computers & Education 2007; 49(4): 976-990. doi: 10.1016/j.compedu.2005.12.001
11. Evangelinos G, Holley D. A qualitative exploration of the EU digital competence (DIGCOMP) framework: A case study within healthcare education. In: Proceedings of the E-Learning, E-Education, and Online Training: First International Conference, eLEOT 2014; 18-24 September 2014; Bethesda, MD, USA. pp. 85-92.
12. UNNES. Student data graph (Indonesian). Available online: https://data.unnes.ac.id/id/dashboard/jumlah-mahasiswa (accessed on 6 July 2024).
13. Hill R, Betts LR, Gardner SE. Older adults' experiences and perceptions of digital technology:(Dis) empowerment,

wellbeing, and inclusion. Computers in Human Behavior 2015; 48: 415-423.
14. Gunawan PS. Water Hyacinth Processing as Art Paper Raw Material (Indonesian). Balai Litbang Kehutan, Sumatera, Medan; 2007.
15. Asosiasi Pulp dan Kertas Indonesia [APKI]. Indonesian Pulp and Paper Directory (Indonesian). APKI; 1997.
16. Irawan Y. Analysis and design of SMS gateway-based RT cover letter automation as an application of the paperless office concept (Indonesian). Simetris J. Tek. Mesin, Elektro dan Ilmu Komput. 2015; 6(1): 175-182.
17. Prasetyo B, Trisyanti U. Industrial revolution 4.0 and the challenges of social change (Indonesian). IPTEK J. Proc. Ser. 2018; (5): 22-27.
18. Suharmanto A. Internet utilization as media in learning pancasila and civics education at SMA negeri 1 Sleman (Indonesian). J. Pendidik. Kewarganegaraan Dan Huk. 2017.
19. Silvana H, Rullyana G, Hadiapurwa A. Information needs of teachers in the digital age: A case study at labschool elementary school universitas Pendidikan Indonesia (Indonesian). Baca J. Dokumentasi dan Inf. 2019; 40(2): 147. doi: 10.14203/j.baca.v40i2.454
20. Astuti KL, Setiawan AI. Fostering teacher's digital competencies and innovative work behavior in facing merdeka belajar policy: Digital informal learning as a mediator. Int. J. Educ. Res. Soc. Sci. 2023; 4(2): 288-295.
21. Umaima FF, Hutabarat E. Bekasi regency workforce readiness to work in the paperless office. FIRM Journal of Management Studies 2021; 6(2): 202. doi: 10.33021/firm.v6i2.1529
22. Ratnaningsih D. Perceptions and personalities of paperless information technology system applications (Indonesian). Modus 2018; 30(2): 158-180.
23. Rosela, Gunansyah G. The role of teachers in cultivating environmental care character in grade IV elementary school students (Indonesian). J. Pendidik. Guru Sekol. Dasar 2022; 10(5): 1450-1461.