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RESEARCH ARTICLE

Digital Opportunities and Internet Outcomes on Educational Domain: A Comparison between Urban and Rural of Indonesian University Students

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ABSTRACT

This study aims to examine possible differences in digital opportunities and educational outcomes between urban and rural students, and to analyze the predictors of traditional sources of capital (e.g. gender, age, and income), digital literacy, and educational use in improving internet outcomes in educational contexts. This study surveyed 457 university students in Indonesia. The analysis showed that the gap between urban and rural university students is significant in terms of the use of information retrieval sources and educational outcomes. Other findings explain that while digital literacy and educational usage contribute positively to improved educational achievement and outcome satisfaction, the influence of traditional capital source factors is reduced. This research contributes to a deeper understanding of digital divide related educational issues in higher education and provides input to all stakeholders so that the educational outcome gap among students can be addressed.

INTRODUCTION

The existence of internet technology aimed to reduce the gap between developed and developing countries, rich and poor, and urban and rural (van Deursen et al., 2015b). Internet technology expands the gap that exists in traditional factors such as gender, education and economics (Van Deursen et al., 2019). Van Dijk, (2020) explains that apart from material factors, aspects of digital literacy and usage variations are also factors in creating gaps between communities. In fact, this gap arises from differences in the quality of digital literacy and variations in internet usage among internet users (Scheerder et al., 2017; Van Dijk, 2020). Those with low digital literacy tend not to be able to get great benefits from their use (van Deursen et al., 2019), while the use of only one domain will have an impact on the low benefits obtained in other domains (Van Deursen et al., 2018).

In the four years since Covid-19 hit the world, including Indonesia, the Indonesian government has tried to improve internet access infrastructure and the quality of human resources for internet users in Indonesia. The increase in infrastructure is evident with the increase in internet user penetration from 64.8% in 2019 to 78.19% by the end of 2023 (apjii.or.id, 2024). Then improving the quality of human resources of internet users through the national movement for digital literacy in 2020-2024,

so that the digital skills index of the community in 2022 is in the high category (3.52) (Ameliah et al., 2022).

Based on the two achievements of the Indonesian government program, it can be assumed that internet access and the digital literacy gap between urban and rural students have been resolved. However, the engagement and educational outcomes of internet use have not been explored in previous research. The problem statement in this study therefore focuses on understanding how digital opportunities affect internet outcomes in the context of student learning in urban and rural areas in Indonesia, as well as exploring the influence of predictors between traditional and digital sources on internet outcomes. From the research statement, it is expected that this study can propose strategies to bridge the gap.

1.1 Research Purposes and Questions

This article broadly aims to analyze the digital opportunity gap and educational outcomes between urban and rural university students in Indonesia. To achieve the main objective, the researcher uses descriptive analysis to identify the level of digital literacy, the use of educational domains, and the educational outcomes obtained by respondents. In addition, through parametric tests, this study will also identify the factors that cause the gap in educational outcomes obtained. The objectives of this study will be answered through the following research questions:

RQ 1: Are there differences in digital literacy, education use, and education outcomes between urban and rural students?

RQ 2: To what extent are predictors of traditional sources of capital (e.g. gender, age, and income) still important in relation to education outcomes after accounting for digital literacy and education outcomes.

LITERATURE REVIEW

2.1 Digital Opportunities

The term digital opportunity was elaborated by J. E. Helsper (2021) to describe two important concepts from the second level of digital divide theory, namely digital skills and usage types. Another term is digital inequalities (E. J. Helsper, 2012a). This concept describes the gap in accessing the internet caused by limited ability to operate internet technology and differences in usage activities. Other discussions explain that digital inequalities are related to access, actual use, and usage skills of digital resources (Vassilakopoulou et al., 2021; Jam et al., 2011).

The issue of improving digital skills or digital literacy in developed countries has been widely studied between 2005-2015 (Van Dijk, 2020), while in developing countries such as Indonesia it only received attention from the government in 2020 through the 2020-2024 digital literacy roadmap (Ameliah, 2022). The relationship between demographic background and the digital literacy gap is also not separated from scholarly research (Inan Karagul et al., 2021). Van Deursen et al. (2014) found that the age range of 16-30 years had a higher level of digital literacy compared to the age range of 31-45 years, 46-60 years, and 60 years and over. Socioeconomic background is also closely related to students' ICT skills (van de Werfhorst et al., 2022). On the issue of region of residence, Yadav et al. (2020) found no difference in digital learning between urban and rural students in India. Differences occur when facing problems in digital learning and ownership of devices for digital learning, where urban students are more advantaged.

Digital skills play a role in improving the quality of educational usage engagement among students (Subramaniam et al. 2023; Hong et al., 2024). Van Deursen et al. (2014) found five buildings of digital skills in the United Kingdom and the Netherlands, which are mobile, operational, information navigation, social, and creative. Van Deursen et al. (2017) termed digital skills as internet skills with the size of operational skills, information-navigation skills, social skills, and creative skills. Meanwhile, Helsper et al. (2021) developed a digital skills instrument with items of technical and

operational skills, information navigation and processing skills, communication and interactional skills, and content creation and production skills.

In Indonesia, digital literacy research is measured from the perspectives of hoaxes, cyberbullying, and data privacy security. The Ministry of Communication and Information of the Republic of Indonesia built a conceptual framework for digital literacy with the dimensions of digital skills, digital ethics, digital safety, and digital culture (Ameliah et al. 2022; Arafah et al., 2023). In examining the use of WhatsApp among women, Kurnia et al. (2020) measured digital literacy with four quadrants, namely: functional consumption, functional production, critical consumption, and critical production. Meanwhile, Halim et al. (2024) also found consumption and production components in building digital literacy among students in Jakarta, Indonesia.

Differences in types of internet use are also a factor in creating a gap in the benefits obtained by internet users (Van Deursen et al., 2018), although in some studies the use of certain domains is also associated with different domain outcomes. Van Deursen et al. (2017) found that economic use not only has a relationship with outcomes from the economic domain, but also has a relationship with social and personal outcomes. Helsper (2012) examined internet usage and outcomes across four domains, namely economic, social, cultural, and personal. Meanwhile, Buchi et al. (2016) measured internet usage with social interaction, information, entertainment, and commercial transactions among students in New Zealand, Sweden, United States, Switzerland, and United Kingdom. Tsetsi et al. (2017) examined variations in use with common activities such as sending emails and downloading files, social interaction was also studied but separated from the type of use. Subramaniam et al. (2023) also examined social interaction and information as digital use in the context of student learning in Malaysia.

2.2 Educational Outcomes

Digital outcome is a concept that describes the third level of the digital divide (Calderón Gómez, 2021). This third level refers to internet outcomes related to differences in the ability to convert access and use into offline benefits (van Deursen et al., 2015a). Referring to Helsper (2012) dan Van Deursen et al. (2018) education issues are included in the economic domain which includes finance and employment. Internet outcomes in some studies are measured by achievement and satisfaction (Helsper, 2021; Subramaniam et al., 2023; Van Deursen et al., 2018).

Based on the literature review above, the hypotheses built in this study are:

H1a : There is no significant difference in digital literacy between urban and rural students.

H1b : There is no significant difference in the use of education between urban and rural students.

H1c : There is no significant difference in educational outcomes between urban and rural students.

H2a : Predictors of digital exclusion based on inequalities in traditional capital (e.g. gender, age, region of residence) are negatively associated with achievement and satisfaction of positive outcomes.

H2b : After accounting for internet skills and internet usage, the influence of traditional capital resources will be smaller in terms of achievement and satisfaction outcomes.

METHOD

3.1 Research Design

This study uses a quantitative approach through an online survey with google forms (G-Forms). The G-Forms link was distributed to selected respondents in two ways, first by sending the link to the WhatsApp number provided by the head of the selected study program. Second, sending a link to the WhatsApp Group created by the head of the study program. The survey was conducted on August 19-September 18, 2024.

3.2 Sampling Procedures

This study used multistage-cluster sampling techniques. The approach was used to take the possibility of students living in urban and rural areas. Furthermore, this technique was conducted in two stages. The first is to determine the region, which is DKI Jakarta as an urban area, and the southern part of West Java as a rural area. The second is to sort out the type of college, i.e. University. In the DKI Jakarta region, three universities were randomly selected from 33 universities: Universitas Negeri Jakarta, Pancasila University, and National University. The Southern West Java region, out of six universities, randomly selected three universities: Universitas Siliwangi, Universitas Galuh, and Universitas Perjuangan 45. After the universities were determined, this research conducted a random technique to determine the study program. Then to determine the students who became the research sample, the researcher randomized based on the list of active students in each study program. Based on the time span given, the data that can be analyzed in this study is 457 respondents.

3.3 Measurements

3.3.1 Digital Opportunities

Digital opportunities referring to Helsper's (2021) research consist of two concepts, namely digital skills and digital engagement. Digital skills are measured with a 25-item instrument referring to the digital skills indicators used by Van Deursen et al., (2017) and E. J. Helsper et al., (2020). This variable was tested on respondents with the question "To what extent do you 'agree' with the statements below regarding how you are when using the internet and technology such as smartphones or computers?". Respondents were given a choice of 5 answer scales "strongly disagree" to "strongly agree."

Exploratory factor analysis was conducted to explore the latent factor structure. For digital skills, the Kaiser-Meyer-Olkin (KMO) measure was .951 and Bartlett's test of sphericity was significant (X2= 9864.756, p <0.000), indicating adequacy of the sample. As such, four factors emerged with eigenvalues greater than 1.00. The four-component solution explained a total of 73.2% of the variance, with component 1 contributing 54.1%, component 2 contributing 8%, component 3 is 6.7%, and component 4 contributing 4.3%. The first component is communication and interaction skills (CIS) consisting of 5 items with a value of a=.926, the second is information navigation and processing skills (INPS) consisting of 6 items with a value of a=.929, the third component is content creation and production skills (CCPS) consisting of 5 items with a value of a=.920, and the last component of technical and operational skills (TOS) has a value of a=.887 with 6 items. The total number of items in this variable is 22 items.

The variable of educational use is measured by 12 items. The question given to respondents was "Thinking about your online activities in the last three months, to what extent have you used the internet for lecture purposes?" Respondents were provided with five answer options from 'never' to 'very often'.

Exploratory factor analysis was conducted to explore the latent factor structure. For e-learning usage, the Kaiser-Meyer-Olkin (KMO) measure was .896 and Bartlett's test of sphericity was significant (X2= 3734.978, p <0.000), indicating adequacy of the sample. As such, three factors emerged with eigenvalues greater than 1.00. The three-component solution explained a total of 74.2% of the variance, with component 1 contributing 53.5%, component 2 contributing 12%, and component 3

is 8.6%. The first component is called the communication source and consists of 4 items (a=.893), the second component is called the information search source with five items (a=.887), and finally the information digging with 3 items (a=.775).

3.3.2 Education Outcomes

Education outcomes are tested with two dimensions, which are: achievement and satisfaction based on the research of Van Deursen et al. (2018). The achievement dimension was tested with 10 items through the question "Think of your online activities in the last three months, how much do you 'agree' and 'disagree' with the following statements related to the Educational Activities you have done online?" The answer options provided with a scale of 5, namely "strongly disagree" to "strongly agree". Exploratory factor analysis was conducted to explore the latent factor structure. For achievement, the Kaiser-Meyer-Olkin (KMO) measure was .957 and Bartlett's test of sphericity was significant (X2= 5669.884, p <0.000), indicating adequacy of the sample. As such, just one factor emerged with eigenvalues greater than 1.00 contributing 79.8%. Cronbach' Alpha value is α=.971.

Next is the satisfaction dimension. This dimension was also tested with 10 items with the question "Thinking about your online activities in the last three months, how 'satisfied' and 'dissatisfied' are you with the following statements related to satisfaction with the Educational Activities you have done online?" Respondents were also given five response scales from "very dissatisfied" to "very satisfied".

Exploratory factor analysis was conducted to explore the latent factor structure. For gratification, the Kaiser-Meyer-Olkin (KMO) measure was .921 and Bartlett's test of sphericity was significant (X2= 3716.016, p < 0.000), indicating adequacy of the sample. As such, two factors emerged with eigenvalues greater than 1.00. The two-component solution explained a total of 75% of the variance, with component 1 contributing 64%, and component 2 contributing 11%. The first component was labeled as communication satisfaction with seven items (a=.930), and the second component was labeled as information seeking satisfaction measured by three items (a=.859).

RESULTS

4.1 Descriptive Analysis

The data was tabulated in SPSS software for descriptive and inferential analysis to answer the research questions. Table 1 presents the demographic distribution of 472 respondents. The results of descriptive analysis show that most respondents are female, the majority are less than 27 years old, the residence category mostly lives in the city, the distribution of respondents is almost evenly distributed across six universities, the average parental income is in the range of 2 million - 4 million rupiah, and most respondents are not working.

Table 1 Demography Distributions of Respondents

Item	n	%
Gender		
Male	218	47.7
Female	239	52.3
Age		
< 27 years (Gen Z)	447	97.8
> 27 years (Gen Y)	10	2.2
Categories		
Urban	273	59.7
Rural	184	40.3
Universities		
Universitas Negeri Jakarta	52	11.4
Universitas Pancasila	97	21.2
Universitas Nasional	65	14.2
Universitas Siliwangi	87	19
Universitas Galuh	74	16.2

Universitas Perjuangan 45	82	17.9
Parents' SES (Rupiah)		
Uncertain	94	20.6
< 2 million	82	17.9
2, 01 - 4 million	117	25.6
4, 01 - 6 million	87	19
6, 01 - 10 million	46	10.1
> 10 million	31	6.8
Students' Status		
Self-employed (offline/online)	19	4.2
Owner/Manager of company that employs others	5	1.1
Manager/supervisor of company/managed by others	3	.7
Employees of companies/agencies owned by others	23	5
Civil servant	1	.2
Educator in educational institutions	12	2.6
Part-time workers	53	11.6
Not yet/ Not working	314	68.7
Others	27	5.9

Table 2 describes the descriptive test results of digital literacy, educational use and educational outcomes. This data will also answer the first research question and hypothesis 1. The data shows that the digital literacy level of students is in the high category. CIS is the highest dimension owned by students compared to other digital literacies. There is no difference in digital literacy between urban and rural students. Differences were found in the use in the context of information seeking, where the use of urban students (M=3.77, SD=.77) was higher than students from rural areas (M=3.61, SD=.78) with a t value (450) = 2.10, $p < 0.05$ (Sig. 0.036). In general, the use of information seeking (M=3.71, SD=.78) was higher compared to information seeking and information digging.

Education outcomes among university students were also high (M=3.72, SD=.59) with achievement outcomes (M=4.08, SD=.70) being higher than communication satisfaction (M=3.24, SD=.72) and information seeking satisfaction (M=3.61, SD=.70). Significant differences between student groups occurred in educational achievements, where urban students perceived higher achievement (M=4.14, SD=.71) than rural students (M=4, SD=.68). This result answers the first research question and hypothesis where H1a is accepted. H1b is partially accepted because only the source of information seeking is different. Likewise with educational outcomes, H1c is partially accepted, where the achievement of results is still different.

Table 2. Descriptive Statistics of Digital Literacy, Education Engagement, and Educational Outcomes

Variables/ Dimensions	**All Students**		**Urban**		**Rural**	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***
Digital Literacy	3.74	.64	3.76	.68	3.72	.57
Technical and operational Skills (TOS)	4.04	.74	4.08	.76	3.99	.71
Information Navigation and Processing Skills (IVPS)	3.73	.80	3.76	.81	3.68	.78
Communication and Interactional Skills (CIS	4.13	.74	4.16	.79	4.07	.66
Content Creation and Production Skills (CCPS)	3.82	.79	3.8	.85	3.84	.68
Education Engagement	3.45	.71	3.49	.71	3.39	.70
Sources of Communication	3.56	.81	3.59	.82	3.52	.80
Sources of Information Seeking	3.71	.78	3.77*	.77	3.61*	.78
Information Digging	2.87	.95	2.89	.97	2.84	.92
Educational Outcomes	3.72	.59	3.76	.60	3.66	.57
Achievements	4.08*	.70	4.14*	.71	4*	.68
Satisfaction of Communication	3.24	.72	3.26	.73	3.22	.70

Satisfaction of Information	3.61	.70	3.65	.71	3.57	.69

N= 457 *p <.05 **p <.01 ***p <.001

4.2 Regression Analysis

The results of the hierarchy regression analysis (see table 3 model 1) show that socio-demographic factors are only associated with achievement outcomes. Females have more educational achievement outcomes than males. Urban-rural location and university status have a negative relationship with educational achievement outcomes in a positive direction. The results in stage 1 answer that H2a is partially accepted. Only gender has a positive relationship with achievement.

Digital literacy and education use were added in the second stage (Table 3 model 2). Unlike when the 2 factors were included, gender did not have a significant relationship. The demographic factor that had a relationship was age, where generation Y (>27 years old) had more educational achievement and communication satisfaction than generation Z (<27 years old). The categories of residence and university status also still have a negative relationship with educational achievement.

Other results showed that technical and operational skills (β=.18, p>0.001), communication and interactional skills (β=.16, p>0.001), and content creation and production skills (β=.11, p>0.05) had significant contributions to achievement, but only content creation and production skills were a factor in increasing information seeking satisfaction (β=.15, p>0.05). The use of information-seeking sources significantly contributes to achievement and satisfaction of educational outcomes. While the use of communication only affects achievement (β=.19, p>0.001), and information digging affects communication satisfaction (β=.10, p>0.05).

The results in model 2 (table 3) also show that the inclusion of digital literacy and education usage variables automatically increases the contribution value and reduces the influence of demographic factors. This finding also answers H2b, where with the presence of these two variables the influence of traditional model resources will be smaller than the results achieved (H2b is partially accepted).

Table 3. Hierarchical Regression Analysis for Education Outcomes on the context of Achievement (A), Satisfaction of Communication (SC), and Satisfaction of Information Seeking (SIS)

Model, step and predictor variables	**Education Outcomes**		
	A	SC	SIS
Model 1			
Gender (M/F)	.10*	.03	.08
Age	.08	.08	.06
Urban-rural Area	-.09*	-.03	-.06
Universities	-.13*	*.02*	-.06
Income	.08	.04	-.00
Student-Employed	-.01	-.06	-.04
R^2	.03	*.01*	.01
F	3.62**	1.45	1.42
Model 2			
Gender	.02	.01	.02
Age	.07*	.10*	.05
Urban-rural Area	-.04	-.02	-.02
Universities	-.10*	.02	-.03
Income	.05	.01	-.02
Student-Employed	.01	.01	.01
Technical and Operational Skills (TOS)	.18***	-.03	.05
Information Navigation and Processing Skills (IVPS)	-.01	.10	.03
Communication and Interactional Skills (CIS)	.16***	.04	.05
Content Creation and Production Skills (CCPS)	.11*	-.12	.15*
Sources of Communication (SC)	.19***	.03	.01

Sources of Information Seeking (SIS)	.26***	.15*	.33***
Information Digging (ID)	-.03	.10*	-.04
R^2	.49	.16	.25
R^2 Change	*.46****	*.17****	*.25****
F	*49.68*	*13.50*	*22.15*

N= 457 *p <.05 **p <.01 ***p <.001

DISCUSSION AND CONCLUSION

This study aims to provide a more in-depth explanation of how the digital gap occurs between urban and rural students. The digital gap referred to in this study is the second and third levels of the digital divide. The use and outcome of digital in this study is narrowed down to the education domain. It is intended that the digital gap in the context of education can be identified and decomposed, so that students can utilize internet technology in the learning process optimally.

The level of digital literacy in this study is included in a high level of five scales (M = 3.74), where the study of the Ministry of Communication and Information of the Republic of Indonesia in 2022 obtained a digital skills level of 3.54. The digital literacy gap between students living in urban and rural areas is not visible. This is certainly inseparable from the role of the government which encourages the improvement of people's digital literacy through the National Movement for Digital Generation (NMDG) 2020-2024. This data shows that 79.4% of respondents have participated in government programs either through workshops or seminars.

The digital gap is evident in the use of information seeking sources, where the use of students from rural areas is still low compared to students from urban areas. This difference in activity has an impact on the achievement of educational outcomes, hence the achievement gap. However, the role of digital literacy and usage type is critical to driving digital outcomes. This study found that when these two factors are present, the role of internet users' socio-demographics as a factor influencing internet outcomes is reduced to no effect. This finding also reinforces van Deursen and Helsper's (2018) research that demographic factors as traditional sources have minimal or even insignificant influence when faced with digital opportunity factors.

The age factor even emerges when aspects of digital opportunities are included as determinants of digital outcomes. Generation Y (>27 years old) achieved more learning outcomes and communication satisfaction than generation Z (<27 years old). This suggests that when adult users have the same digital literacy as the generation below them, they will get better digital outcomes. However, if age is categorized as a whole, 16–35-year-olds have better educational outcomes than 36-45- and 56–65-year-olds (van Deursen & Helsper, 2015b). The income category in this study differs from Torres-Diaz & Duart (2015) who found that university students in Ecuador who had a higher income had better digital outcomes. Meanwhile, studies in Indonesia do not show the same results.

This study has also enriched the development of the concept of digital usage types in digital divide studies by raising the issue of digging for information. Scholars such as J. E. Helsper (2021) and Van Deursen et al. (2018) examine types of use with economic, social, cultural, and personal domains. Each domain is divided by sub-domains such as the economy is divided by property, financial issues, including education. However, when building usage instruments in the context of education, it is still studied in general. Büchi et al., (2016) examined internet usage with social interaction and information seeking. Meanwhile, Tsetsi et al. (2017) tested social interaction activities, Likewise, Subramaniam et al., (2023) tested social interaction and information as digital use in the context of learning. Through the factor analysis test, this study successfully developed the use of education with three variants, which are sources of communication or social interaction, information seeking, and information digging.

The results can be concluded that the difference in digital opportunities between urban and rural students lies in the use of information seeking and achieving results. Another conclusion is that

inclusion in digital opportunities is more of a factor in students getting digital outcomes than traditional capital sources.

Recommendations

This study recommends that the government design programs to improve the quality of technology use skills, especially operational skills, communication and interaction skills, and content creation and production skills. Meanwhile, lecturers and policy makers at the University need to encourage the utilization of technology in the teaching and learning process in a more massive direction considering that technology will continue to develop with various platforms and functions.

AUTHORS' CONTRIBUTIONS

Umar Halim[1*] contributed to article review, research instrument development, analysis, and article writing.

Nurul Hidayat[2] contributed to the construction of the sample frame from the random selection level of the University, the Study Program, and students who became research respondents.

Muhamad Rosit[3] contributed to coordinating with the University and study programs that became the research sample, as well as helping to obtain a list of active students from each study program to be systematically randomized.

Ihsan Suri[4] contributed to the establishment of a google form link that was used and coordinated with students who became research respondents, as well as coding in SPSS.

Daniel Handoko[5] contributed to reviewing related articles to be used as references in the preparation of instruments and article writing.

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