THE EFFECT OF DIGITAL LITERACY, SELF-AWARENESS, AND CAREER PLANNING ON ENGINEERING AND VOCATIONAL TEACHER EDUCATION STUDENTS' LEARNING ACHIEVEMENT

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Abstract

This study aimed to determine the direct and indirect effects of digital literacy, self-awareness, career planning on student achievement of prospective teachers of education and technical and vocational training (TVET). This type of research is ex post facto with quantitative data. The method used was comparative causal differential with path analysis. The problems posed are (1) whether there is a direct effect of digital literacy, self-awareness, career planning on learning achievement, and (2) whether there is an indirect effect of digital literacy and self-awareness on learning achievement. The results showed that (1) Digital Literacy and Self-awareness directly affect Career Planning by 42.8%. Taken together, digital literacy, self-awareness, and career planning directly affect student learning achievement. The effect of these three variables to student achievement is 50.9%. (2) The direct effect of digital literacy and self-awareness on learning achievement tends to be dominant compared to the indirect effect through Career planning. The total effect of digital literacy on learning achievement is 0.33, with details of the direct effect of 0.263 and the indirect effect of 0.068 through career planning. The total effect of self-awareness on learning achievement is 0.4809, with further information of the direct effect of 0.345, and the indirect effect of career planning is 0.1359. Research recommendations need to be expanded by adding respondents and job literacy variables among prospective TVET teacher students as independent variables.

Keywords – Workforce preparation, Digital literacy, Career planning, Learning achievement.

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1. Introduction

The Industrial Revolution 4.0 has recently become an important issue among academics and has been a challenge in educational innovation from elementary to tertiary levels. The industrial revolution 4.0 is a process and the result of automation in the industrial environment to maximize production both in quantity and quality through computer technology developments, more precisely utilizing virtual models using cyber systems to monitor processes with decentralized decision-making models (Hammer, 2018). The Industrial Revolution 4.0 has several innovations that are considered advantages, including (1) high

productivity, (2) changing the character of work by eliminating some current jobs and creating new jobs, and (3) replacing manual work with knowledge-based work (Dimitrieska, Stankovska & Efremova, 2018). To achieve these three innovations, the industry must adhere to four basic principles, namely: Interoperability, informational transferability, technical support, and decentralized decision making (Hammer, 2018).

Interoperability is defined as the ability of two or more device systems to synergize by exchanging information and using the information that has been traded to support the success of the process (Radatz et al., 1990 as cited in Noura, Atiquzzaman & Gaedke, 2019). Informational transparency is the ability of information systems to combine digital sub-systems with sensors in real-time to create virtual models with data that is easy to access, analyze and act upon. Meanwhile, Technical support is the ability to collect and visualize information automatically when solving urgent problems. Thus, the essence of the Industry 4.0 concept is an effort to automate systems in the industry by applying digital technology or information technology to the production process.

The Industrial Revolution 4.0 caused global changes that gave birth to competition for industrial workers. Competition for industrial workers occurs both nationally and internationally. According to Serbes and Albay (2017), global changes have created an atmosphere where almost everything competes with each other. It is a challenge for the world of education. Two challenges in the world of education are the challenge in adjusting the competence of graduates to the demands of the industry and the challenge to win to compete at a global level with graduates from other countries. Many parties have made changes to the educational innovation landscape (Shahroom & Hussin, 2018). In 2018, higher education in the Republic of Indonesia began to develop more innovative learning systems, adjust learning curricula, and improve student abilities in four areas, namely (1) data information technology (IT), (2) operational technology (OT), (3) internet of things (IoT), and (4) big data analytics. This higher education integrates digital and human physical objects to produce competitive graduates in data literacy, technological literacy, and human literacy (Maemunah, 2018).

The Education study program at the Faculty of Engineering is very relevant to preparing workers in the industry. Teachers who teach at technical education and training institutions and vocational high schools (TVET) are graduates of this study program. TVET, as an educational institution that prepares industrial workers, prepares its graduates by developing individual knowledge and skills for careers as industrial workers now and in the future (Mohamed et al., 2020). TVET teachers have a big responsibility to prepare their students to win in this competition. Prospective TVET teacher students become an important part of preparing industrial workers, especially at the operator and technician levels.

Furthermore, the dynamics of changing types of work have been characterized by job losses and new jobs appearing. Manual-based jobs are replaced with knowledge-based jobs that challenge students or students to make adjustments to career choices. The right Career Planning will increase the chances of winning the competition in getting a job in the Industrial Revolution era. As prospective workers, students must conduct self-assessment and determine job choices following their talents, interests, and competencies. For a student, understanding the types of work (Job Literacy) well and making job choices or planning careers before they enter higher education or certain areas of expertise in vocational schools is ideal. By determining their job aspirations before entering college, they are expected to commit to preparing skills according to the chosen program. They are more focused on the career that has been planned.

Furthermore, they will focus on limiting activities that are not under the ideals of their chosen career. They will try to find relevance in their studies and evaluate the efforts that have been made. Thus, choosing and planning the right job will encourage commitment to prepare oneself seriously to learn what is needed when working later. This will certainly have an impact on learning outcomes or learning achievements.

Appropriate self-assessment will foster self-awareness, which in the end, students will do the right things to improve their adaptability to job changes. Self-awareness is an intrinsic human factor in which a person

knows and acknowledges their strengths and weaknesses. Self-awareness will grow in line with individual self-assessment efforts. Someone who knows their weaknesses and strengths has the potential to make the right career choice. He tends to have high adaptability. A person will do his best to pursue his goals. He will also learn to deal with his weaknesses, not become obstacles in achieving his career goals. He will study hard and achieve success in adapting to the changes that occur. According to Schuesslbauer, Volmer and Göritz. (2018), to face the changing world of work, organizations seek job applicants and place a high value on the ability to adapt to changes that occur.

Learning achievement is evidence of successful learning and, at the same time, shows a person's ability to adapt to new things. Digital literacy, technology literacy, and human literacy are believed to be important aspects of the adaptability of workers in the era of the Industrial Revolution 4.0. These three aspects are included in the curriculum of educational institutions, especially higher education. Student-teacher candidates are required to be creative and proactive in finding learning references relevant to these three aspects so that when they become teachers, they can become examples of literacy and become pioneers of lifelong learning (Djawad, Suhaeb & Jaya, 2018). Educators as agents of change need to rebuild a learning community that has self-awareness of the importance of continuing to learn so that knowledge increases (Serbes & Albay, 2017). Changes in work and competency requirements require changes in the effective teaching and learning process to achieve achievement. According to (Shahbodin, Maria, Che-Ku-Mohd and Jaafar (2019), in era 4.0, learning was more student-centered, not teacher-centered. Through genuine learning, students were able to adapt to changes that occurred in the industry.

All the descriptions above show that digital literacy, self-awareness, career planning, and student achievement are important issues to be researched to develop higher education innovation strategies in responding to the challenges of changing job characteristics in the Industrial Revolution 4.0 era. Several researchers have investigated these objects. Dibabe, Wubie and Wondmagegn (2015) examines the factors that affect students in choosing accountant jobs as their careers. As a result, it is proven that there are 4 (four) dominant factors affect students' choice of accountant work. These factors are intrinsic, extrinsic factors, perceptions of accounting work, and environmental factors (Dibabe et al., 2015). Another study conducted by Goldfarb (2018) proved that intrinsic motives rank higher in influencing career choice than extrinsic motives. Tomczyk (2020) researched digital literacy among teacher candidates in 2019. He studied issues related to digital literacy self-evaluation using text editors, spreadsheets, and presentation and graphics software.

As the main issue, another research was conducted at the Pedagogical University of Cracow, one of the largest Polish universities that train Education staff. Four hundred fifty teachers show different issues related to the digital literacy of pre-service teachers (Tomczyk, 2020). Prior, Mazanov, Meacheam, Heaslip and Hanson (2016) studied how digital literacy and attitude affect students' confidence in online learning. A study by Pala and Başıbüyük (2021) found that digital literacy skills have a positive effect on students' academic achievements in science, technology, and society area. Another researcher, Kreibich, Hennecke and Brandstätter (2020) examined student self-awareness, showed that self-awareness plays an important role in identifying learning barriers. Then, Hof and Strupler-Leiser (2014) conducted a study on the determinants of a career change for individuals who change jobs to become teachers as a second career in the TVET system in Switzerland. This system requires teachers of vocational subjects to have a previous career in a particular field. Therefore, all vocational teachers have changed jobs from their last jobs to become teachers (Hof & Strupler-Leiser, 2014). Then Tolentino, Sibunruang and Garcia (2019) examined the relationship between career adaptability, self-monitoring, academic effort, and job search self-efficacy among college students. The results show a positive relationship between career adaptability and job search self-efficacy through stronger self-monitoring among students who study hard (Tolentino et al., 2019). Apriansyah (2014), a teacher in Indonesia, looked at high school students and found a positive relationship between career planning and student achievement.

The above discussions showed that studies have been done on digital literacy and selfawareness effect on students learning and achievement. However, these studies were conducted in different settings, for

example the study by Pala and Başıbüyük (2021) was to investigate digital literacy effect to fifth grade students' achievement. In addition, Little has been done to examine how digital literacy and self-awareness affect career planning. Therefore, the purpose of this study is to: (1) Analyze the direct and indirect effects of digital literacy and self-awareness on student learning achievement. (2) Analyze the direct effect of digital literacy, self-awareness on student career planning. (3) Analyze the indirect effect of digital literacy and self-awareness of student achievement in the Faculty of Engineering, State University of Jakarta.

The novelty of this research is the discussion of the implications of changing job characteristics in the industry as a result of the 4.0 industrial revolution, where digital literacy, self-awareness, career planning, and learning achievement are used as research variables. This is an important part of improving the adaptability of Education graduates to changing job characteristics in the industry.

1.1. Research Problem

There are four variables studied that are closely related to preparing prospective TVET teachers in facing changes in the world of work as a result of the industrial revolution 4.0, namely: digital literacy, self-awareness, career planning, and learning achievement. The results of this study are expected to answer several important issues regarding the preparation of industrial workers. The research problem is limited to the causal relationship between digital literacy, self-awareness, career planning, and learning achievement of prospective TVET teacher students. The questions posed as the formulation of the research problem are (1) whether there is a direct effect of digital literacy, self-awareness, career planning on learning achievement and (2) whether there is an indirect effect of digital literacy and self-awareness on learning achievement career planning.

2. Literature Review
2.1. Learning Achievement

Learning achievement is a collection of learning outcomes achieved by students after attending lessons at school or college. Meanwhile, learning outcomes are competencies in the form of students' knowledge, attitudes, and skills after following the subject. Learning achievement is usually expressed in a score called the achievement index. Learning achievement is an evidence of student success in learning or students' ability to carry out learning activities. According to Tremblay (2013), learning achievement results from a learning effort in the form of values as a measure of the skills of a person's learning effort. Learning achievement is indicated by the number of report cards or summative test scores (Tremblay, 2013). Experts state that learning achievement is influenced by many factors that come from within (internal) and from outside (external) individuals (Yusri, Kibtiyah & Hamim, 2020). This research is focused on digital literacy, self-awareness, and career planning. Achievement is a skill or concrete result that students can achieve in a certain period. A person succeeds in learning achievement in mastering the knowledge and skills developed in the lesson, usually indicated by a test score given by the teacher (Asmara, 2009).

In this study, learning achievement is a collection of student learning outcomes after attending several courses in a certain period expressed in a score called the Achievement Index.

2.2. Digital Literacy

Gilster (1997) first proposed the term digital literacy as the ability to understand and use information from various digital sources. Digital literacy is the interests, attitudes, and skills of individuals who use digital technology and communication tools to access, manage, integrate, analyze and evaluate information, build new knowledge and create and communicate with others to participate effectively in the community (Djawad et al., 2018).

Digital literacy and information literacy are closely related. Digital literacy emphasizes the use of tools, while information literacy emphasizes the content or content of the information. Jisc in Tang and Chaw (2015) emphasizes that digital literacy is context-dependent and suggests seven elements of the digital literacy model: media literacy, information literacy, digital scholarship, learning skills, communication and

collaboration, career and management identification, and ICT literacy (Tang & Chaw, 2015). Literacy Information and communication technology (ICT) shows a person's ability to use computers, communication tools, and social networks appropriately. ICT Literacy skills are useful in researching, setting up systems, and evaluating information that can encourage learning and work effectively (Thammasaeng, Pupat & Phetchaboon, 2016). According to Siero quoted by Rusydiyah, Purwati and Prabowo (2020), digital literacy competence consists of using, understanding, accessing, managing, collecting, and evaluating information from sources based on information and communication technology/ICT.

Information technology students use digital literacy as a tool and source of learning so that in this study, digital literacy is defined as the ability of students to use Information and Communication Technology as a learning resource, namely accessing, selecting, collecting, and evaluating scientific and technological information by the field of science being studied.

2.3. Self-Awareness

Williams and Morin as cited in Sutton (2016), stated that self-awareness is a difficult term to define. They highlight that there are many variations in this definition. Although definitions vary, self-awareness is generally seen as an inward-focused evaluative process in which individuals use reflection to make comparisons of themselves with reality and feedback from others. According to Ashley and Reiter-Palmon (2012), self-awareness is an inward-focused evaluative process in which individuals make self-comparisons intending to increase knowledge for the better. This opinion refers to the theory of Duval and Wicklund, quoted by Rubens, Schoenfeld, Schaffer and Leah (2018), which states that individuals periodically focus inward and begin the process of comparison to assess themselves. The important concepts are self-knowledge and self-introspection (Rubens et al., 2018). By knowing oneself, individuals can realize their strengths and weaknesses. In this case, Carden, Jones and Passmore (2021) suggests that self-awareness is knowledge related to various aspects of personality, including strengths, weaknesses, beliefs, interests, motivations, and emotions. Self-awareness is also a process that helps individuals identify career needs that are suitable for them. Self-reflection as a core concept of self-awareness is an evaluation process that requires an accurate perception of one's strengths and weaknesses to be projected against the challenges faced by individuals.

Self-introspection or self-assessment, or self-reflection (self-awareness assessment), can help a person get to know himself better. According to Measure, awareness consists of three components: emotional self-awareness, accurate self-assessment, and self-confidence. Accurate self-assessment means knowing one's strengths and limitations (Arabsarhangi & Noroozi, 2014). Zeman (2006) divides awareness into several categories, including: (1) Awake conditions, namely conditions when individuals perceive and interact. (2) Experience, namely individual alertness to events that take place around them. (3) Individual mental conditions, which include beliefs, hopes, intentions, and desires. (4) Individual self-awareness includes self-recognition, self-knowledge, feelings of ownership of one's thoughts, ideas, and emotions. Thus, self-awareness can be broadly defined as the extent to which people are consciously aware of their internal state. Their interactions or relationships with others are seen as overarching theoretical constructs. Self-awareness is operationalized in different ways depending on the focus of the research to be carried out (Sutton, 2016).

In this study, self-awareness is defined as students' ability to recognize their strengths and weaknesses to achieve success in higher education to achieve their career goals.

2.4. Career Planning

A career is not just a job but broader than that. According to Sirbu, Popa and Pipa (2014), a career is one of the roles and goals of individuals or organizations according to the system in which they are located. Likewise, career planning is not just a job choice but is a search for individual preparations to get a job according to their interests and talents. Zlate (2004) suggests that personal career planning is all acts of

self-assessment, opportunity exploration, and goal setting designed to assist individuals in making job choices and career changes. This complex action requires systematic and careful thinking in formulating short-term and long-term goals (Antoniu, 2010). In line with that, Minor (2014) suggests that career planning is a lifelong exploration and planning process of one's career and educational goals according to one's interests, values, talents, personality, and aspirations. Career planning involves thinking about which educational and occupational pathways will provide satisfaction and fulfillment in all aspects of one's present and future life (Minor, 2014). Career planning steps begin with self-awareness, then explore career & job information, seek network strengths, learn more about a particular job, career, or organization by conducting an information-gathering interview (Sumner, n.d.).

Based on the opinions of the experts above, in this study, career planning is defined as a series of activities to identify oneself, seek information, identify and choose jobs that match the talents, interests, and competencies of individuals as well as efforts to prepare themselves and make the selected job a long-term goal.

3. Research Method

This research is an ex post facto research type with quantitative data and comparative causal differential research method with path analysis.

3.1. Research Model

The research model describing the causal relationship among the independent variables digital Literacy (X1), Self-Awareness (X2), and Career Planning (X3) with the dependent variable Learning Achievement (Y) is shown in the following Figure 1:
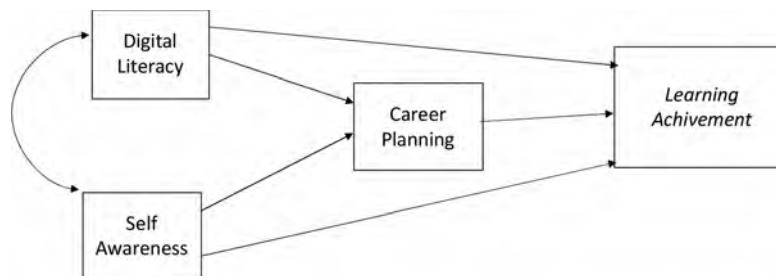

Figure 1. Research model

The population of this research is students of the Faculty of Engineering, the State University of Jakarta, who are still active in the 2018/2019 academic year. Ten people from each study program were taken as research samples. The number of instruments analyzed was collected from 95 students.

Before testing the hypothesis, several requirements tests were carried out. Testing Requirements Analysis in this study uses the Classical Assumptions, namely, normality test, multicollinearity test, and linearity test with the following objectives:

1. Normality test was carried out so that statistical calculations can be generalized. It is based on the assumption that if a sample is drawn from a population randomly, the mean value of a population tends to be normal (Kerlinger, 1992). Normality test was carried out by Kolmogorov-Smirnov test.

2. Multicollinearity test was done by looking at simple correlation coefficients between variables. According to Lewis-Beck, as Sullivan (1990) quoted, the correlation coefficient of the independent variables should not be 0.8 because if the correlation coefficient between variables is 0.08, there will be multilinearity. Multicollinearity can cause a significant decrease in the correlation index in the partial correlation if the independent variable is controlled. The simple

correlation between variables is done by using the Product Moment correlation formula from Karl Pearson.

3. The linearity test between variables was carried out with the F test at a significance of 0.05. The provisions used to measure the linearity between variables are the value of F. If $F_{count} < F_{table}$ on Dev. Linearity, the regression is expressed as linear. Then, if the calculated F value $> F_{table}$ on linearity, the regression direction is declared significant.

4. Path model testing was done by looking at the Beta value—provisions or criteria used for paths whose Beta value < 0.05 is removed (Pedhasur-Elazar, 1973). From the regression analysis results, all Beta deals> 0.05 with a significance value < 0.05. Thus, it conclude can maintain the path model.

Hypothesis testing was carried out after the four conditions are met. Hypothesis testing was done by regression and path analysis. Regression was carried out to test the direct effect of path analysis to calculate the indirect outcome.

4. Research Results

The research data are descriptively shown in Table 1. In the table, the researcher only indicates the average value and standard deviation to prove whether there is an oddity in the data or not. The average digital literacy score of students is 71.8737, greater than the standard deviation of 11.476. The mean score of Self-awareness (Self-awareness) of students is 118.9, with a standard deviation of 11.84. The mean career planning score is 134.27, with a standard deviation of 12.58. Meanwhile, the average value of the achievement index is 3.36, with a standard deviation of 0.18. The descriptive statistical data shows that the mean value of all variables is > The standard deviation value so that there are no data anomalies and the study can continue the analysis.

Normality test was carried out through the One-Sample Kolmogorov-Smirnov Test. Acceptance criteria used in the normality test of the data in this study are as follows. If the significance value is 0.05, the data are declared normal. On the other hand, if the data significance is 0.05, the data are reported abnormal. The data from the SPSS One-Sample Kolmogorov-Smirnov Test (see Table 2) show that for the Exact and Monte Carlo test models, all variables have a significance value of 0.05, so it can conclude that the research variable is normal.

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Digital Literacy	95	50.00	94.00	71.8737	11.47638
Self Awarness	95	91	144	118.89	11.848
Career Planing	95	99	161	134.27	12.585
Larning achevement	95	2.95	3.85	3.3603	.17967
Valid N (listwise)	95				

Table 1. Description of research data

No	Exact	Digital Literacy	Self Awarness	Career Planing	Larning Achevement
1	Asymp. Sig. (2-tailed)	0.000	0.200	0.153	0.028
2	Exact Sig. (2-tailed)	0.057	0.905	0.544	0.315
3	Monte Carlo Sig. (2-tailed)	0.057	0.908	0.546	0.318
4	Point Probability	0.000	0.000	0.000	0.000

N= 95

Table 2. Results of the normality of one-sample kolmogorov-smirnov test

Normality test results of KS test model Exact Sig. (2-tailed) shows that the results of all variables meet the requirements for a significance value > 0.05. Although testing with Asymp. did not meet the requirements for significance, but based on the Exact and Monte Carlo test models, the test met the requirements, the data were considered normal. The Digital Literacy variable (X1) shows the value of Sig. = 0.057 > 0.05. The Self-awareness variable is (X2) Sig. = 0.905 > 0.05. Career Planning Variable (X3) shows the value of Sig. = 0.544 > 0.05. The Learning Achievement variable (Y) shows the value of Sig. = 0.315 > 0.05. Based on the Kolmogorov-Smirnov analysis, the test of all variables was declared Normal–likewise, the Monte Carlo Sig Model. (2-tailed) which produces a significance value of the Digital Literacy Variable (X1) with a value of Sig. = 0.057 > 0.05. Variable Self-awareness (X2) shows Sig. = 0.908 > 0.05. The career planning variable (X3) shows Sig. =0.546 > 0.05. Variable Learning Achievement (Y) shows the value of Sig. = 0.318 > 0.05. Although the KS value is weaker than other tests, the Kolmogorov-Smirnov Test can be used so that the data generated in this study meets one of the requirements for path analysis.

Next is the multicollinearity test. According to Lewis-Beck, quoted by Sullivan (1990), the correlation coefficient between independent variables should not be 0.8. If the correlation coefficient between the independent variables is 0.8, there will be a drastic decrease in the partial correlation index if there are controlled independent variables. The results of Pearson's calculations using SPSS show the correlation coefficient values and significance values as follows.

Variable	r (Pearson Correlation)	Siq (2 tailed)	N
X1- X2	0.399^{**}	.000	
X1- X3	$.0.459^{**}$	.016	
X1 - Y	0.523^{**}	.005	95
X2 - X3	0.611^{**}	.000	
X2 – Y	0.614^{**}	.000	
X3 – Y	0.599^{**}	.000	

Table 3. Summary of the correlation coefficient (pearson) among variables

No	Variable	VIF	Tolerance	Conclusion
1	X1-Y	1.304 < 10	.767>0,1	**
2	X2 –Y	1.642 < 10	.609>0,1	**
3	X3 –Y	1.748 < 10	.572>0,1	**

**There is no multicollinearity

Table 4. Value of VIF and tolerance of research variables

Table 3 shows that all the correlation coefficients among variables to be tested by path analysis are 0.08. Thus, there is no multicollinearity of the data when the data are used to test the hypothesis. It can also be proven by using the VIF price and the SPSS processed Tolerance Value. If the VIF value is < 10 and the Tolerance value is > 0.1, and there is no multicollinearity in the two variables.

Based on Table 4, it can be concluded that the relationship among variables does not indicate the potential for multicollinearity.

Path analysis requires that the relationships in the path analysis model follow a straight line or show a linear relationship. The linearity test and the linearity significance test of the regression model formed based on the following hypothesis were used to determine this. To determine linearity between variables, the Dev From Linearity column of the Means module is used. Linearity determines regression through the SPSS program. The confidence level of the F_{table} used is 95%, or the test is used at a significance level of 0.05. The degrees of freedom for the linearity test is (k-1; n-k), while the degrees for the significance test are (1; n-2). In this study, the number of variables is four, and the value of n is 95. So, the F_{table} to test the linearity of 0.05 F (3.91) is 2.68. Meanwhile, the significance of the

regression direction is 0.05F (1;93) is 3.92. Based on the SPSS processed ANOVA table, the calculated F_{count} obtained is shown in Table 5.

Based on the summary of the calculated F-count from the Anova Test table confirmed with the F-table with the acceptance criteria at a significance of 0.05, it can be concluded that all independent variables and intervening variables studied have a linear relationship to the dependent variable learning achievement.

No	Variable		F_{count}		F_{Table}	Conclusion
1	X1 – X3	Linearity	27.164	≥	2.68	Linear
		Dev Linearity	2.117	≤	3.92	Significant
2	X2 – X3	Linearity	55.661	≥	2.68	Linear
		Dev Linearity	1.106	≤	3.92	Significant
3	X1 - Y	Linearity	35.588	≥	2.68	Linear
		Dev Linearity	1.169	≤	3.92	Significant
4	X2 - Y	Linearity	65.032	≥	2.68	Linear
		Dev Linearity	1.409	≤	3.92	Significant
5	X3- Y	Linearity	67.636	≥	2.68	Linear
		Dev Linearity	1.718	≤	3.92	Significant

Table 5. Calculated F value data for linearity test among variables

4.1. Path Model Testing

Path model testing was done by looking at the Beta value. The criteria used for paths whose Beta value is < 0.05 are removed (Pedhasur-Elazar, 1973). From the results of the Regression Analysis, all Beta values are > 0.05 with a significance value of < 0.05. Thus, the path model can be maintained. The data analysis requirements test results include the Normality test, Multicollinearity test, and Linearity test. Path Model Testing shows that all the conditions are met to continue the Hypothesis test with Path analysis.

4.2. Hypothesis Testing

The significant Standardized Coefficients in table 6 are used as path coefficients and entered in the path equation above to test the model and at the same time to get the value of direct and indirect effects in testing the hypothesis. Calculation of the correlation between additions partially by controlling for other variables was done through SPSS. The results are presented in Table 6 below.

Coefficient					
Variabel	Correlations Partial	Standardized Beta	t	Siq	Determination (R^2)
X1-X3	0.459	0.255	2.970	0.004	0.428
X2-X3	0. 525	0. 509	5. 913	0.000	
X1- Y	0.312	0.263	3.134	0.002	0.509
X2- Y	0.359	0.345	3.670	0.000	
X3- Y	0.277	0.267	2.755	0.007	

Table 6. Coefficients standardized beta and factor of determination

4.2.1. First Hypothesis

H0: There is no significant direct effect between digital literacy (X1) and self-awareness (X2) on career planning (X3) either individually or simultaneously.

H1: There is a significant direct effect between digital literacy (X1) and self-awareness (X2) on career planning (X3), either individually or simultaneously. To test the impact of the independent variables X1 and X2 on the intervening variable Career planning (X3), consider the table of SPSS results below.

The hypothesis above is broken down into three parts, namely:

1. Testing the effect of the Digital Literacy variable (X1) on Career planning (X3).
2. Testing the impact of Self-awareness (X2) on Career Planning (X3).
3. Testing the impact of digital literacy (X1) and Self-awareness X2 simultaneously on Career Planning (X3).

Referring to Table 6, the Beta Coefficients of the independent variable Digital literacy (X1) is 0.255. The significance value is 0.004 < 0.05, which means that H0 is rejected and H1 is accepted. Therefore, it can be concluded that there is a direct and significant effect of Digital literacy (X1) on Career Planning (X3). Coefficients Beta Variable Self-awareness (X2) is 0.509 with a significance value of 0.000 <0.05, which means that H0 is rejected and H1 is accepted. It can be concluded that there is a significant direct effect of Self-awareness (X2) on the intervening variable Career Planning (X3).

Testing the effect of Digital literacy (X1) and Self-awareness (X2) simultaneously on career planning was carried out with the F test. The following is the ANOVA table for the analysis.

ANOVAᵃ						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	6369.546	2	3184.773	34.400	.000ᵇ
	Residual	8517.339	92	92.580		
	Total	14886.884	94			

ᵃDependent Variable: Career Planning
ᵇPredictors: (Constant), Self Awarness, Digital Literacy

Table 7. Regression results of independent variables with intervening

In Table 7 above, the calculated F_{count} obtained is 34.4. This value is greater than the F_{table} 0.05 F (3;91) of = 2.68 and the significance value is 0.000 < 0.05. It means that H0 is rejected and H1 is accepted. It can be concluded that simultaneously Digital Literacy (X1) and Self-awareness(X2) have a significant direct effect on the intervening Career Planning (X3) variable.

Referring to Table 6, the simultaneous termination value (R2) is 0.428, which means that the variable effect of Digital Literacy (X1) and Self-awareness (X2) on Career Planning is 42.8%. Other factors affect students in doing career planning besides digital literacy and Self-awareness. The magnitude of the effect of these other factors is 58.2%. Errors that occur can be calculated by the formula $e_1 = \sqrt{1 - R^2}$ Peahazur (1973: 587). The result is $e_1 = 0.756$.

The regression equation between the independent variable Digital literacy (X1) and self-awareness (X2 with Intervening variable Career Planning (X3) based on figure 2 can be written as X3 = 0.255X1 + 0.509X2 + 0.756.
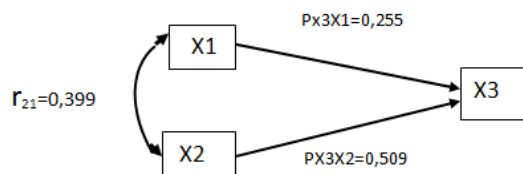

Figure 2. Testing model of the direct effect of X1 and X2 on X3

4.2.2. Second Hypothesis

H0: There is no significant direct effect of Digital Literacy (X1), Self-Awareness (X2), Career Planning (X3) on Student Learning Achievement (Y) either individually or simultaneously.

H1: There is a significant direct effect of digital literacy (X1), Self-Awareness (X2), Career Planning (X3) on Student Learning Achievement (Y) both individually and simultaneously.

Referring to Table 6, the Beta (path coefficient) of the independent variable Digital Literacy (X1) on the dependent variable learning achievement (Y) is 0.263 with a significance value of 0.002 < 0.05. It means that H0 is rejected and H1 is accepted. It can be concluded that there is a direct and significant effect of the independent variable Digital literacy (X1) on the dependent variable on learning achievement (Y). It also applies to the independent variable self-awareness (X2). The beta value obtained is 0.345 with a significance value of 0.000. It shows that 0.000 < 0.05, which means H0 is rejected and H1 is accepted. It can be concluded that there is a direct and significant effect of the independent variable self-awareness (X2) on the dependent variable learning achievement (Y). The significant Beta value of the career planning intervening variable (X3) on the dependent variable learning achievement (Y) is 0.267 with a significance of 0.007 < 0.05. It means that H0 is rejected and H1 is accepted. It can be concluded that there is a direct effect of student career planning on their learning achievement.

The results of the regression between the independent variables Digital Literacy (X1) and Self-Awareness (X2) and the intervening career Planning (X3) variable on the dependent variable Learning Achievement (Y) are shown in Table 8. The calculated F value obtained is 31.501. This value is greater than the value of F_{table} (F_{count} = 31.502 ≥ F_{table} = 2.68). The significance value is 000 < 0.05, which means that together Digital Literacy (X1), Self-Awareness (X2), and Career Planning (X3) have a direct and significant effect on Learning Achievement (Y). The termination value (R^2) of Digital Literacy (X1), Self-Awareness (X2), and Career Planning (X3) together is 0.509. It means that the magnitude of variables X1, X2, X3 on Y is 50.9%, and other factors affect student learning achievement by 49.1%. Errors that occur can be calculated by the formula $e_2 = \sqrt{1 - R^2}$ the result is e_2 = 0.701.

ANOVA[a]						
	Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	1.546	3	.515	31.502	.000[b]
	Residual	1.488	91	.016		
	Total	3.034	94			

[a]Dependent Variable: Learning Achievement
[b]Predictors: (Constant), Career Planing, Digital Literacy, Self-Awareness

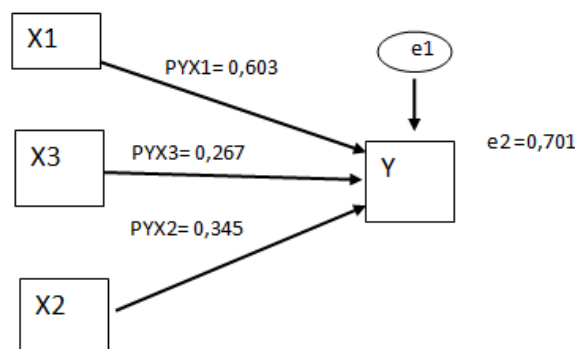Table 8. Regression results of X1, X2 and X3 against Y

Figure 3. Testing model of direct effect of X1, X2, and X3 on Y

4.2.3. Third Hypothesis

H0: There is no significant indirect effect between digital literacy (X1), self-awareness (X2) on student learning achievement (Y) through career planning (X3).

H1: There is a significant indirect effect between digital literacy (X1), self-awareness (X2) on student learning achievement (Y) through career planning (X3).

Based on Table 6, first, the path coefficient value which shows the direct effect between the independent variable digital literacy (X1) and the dependent variable learning achievement (Y) is 0.263, while the indirect effect between digital literacy (X1) and the dependent variable is learning achievement (Y) through career planning is 0.0681. The magnitude of the impact of total digital literacy on learning achievement is 0.263 + 0.0681 = 0.3311. From these results, it can conclude that the direct effect of digital literacy on learning achievement is more dominant than the indirect effect through career planning.

Second, the path coefficient value, which shows a direct effect between the independent variable Self-Awareness (X2) and the dependent variable learning achievement (Y), is 0.345. The indirect impact between Self-Awareness (X2) and the dependent variable learning achievement (Y) through career planning is 0.509 × 0.267 = 0.1359. The magnitude of the total effect of Self-Awareness (X2) on learning achievement is 0.345 + 0.1359 = 0.4809.

These results can conclude that the direct effect of self-awareness (X2) on learning achievement is more dominant than the indirect effect through career planning. A summary of the indirect effect coefficients and the effect of other factors can be seen in Figure 4.
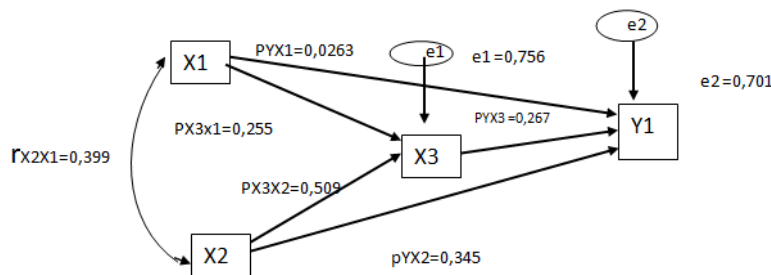

Figure 4. Model of effect test results among research variables

The total results of the calculation of the significant path coefficients are the same as the results of the Simple Correlation Coefficient (Pearson) so that the measure is correct. Table 9 shows a summary of the results of the path coefficient calculations.

Variable	Effect Coefficients				TOTAL	Coefficients (Pearson)
	DE	IDE	U	S		
X1 - X3	0.255	-	0.2031	-	0.4581	0.459
X2 - X3	0. 509		0.1018	-	0.6108	0.611
X1 – Y	0.263	0.0681	0.1919		0.523	0.523
X2 – Y	0.345	0.1359	0.1321	-	0.613	0.614
X3 – Y	0.267	-	-	0.3121	0.5982	0.599

Annotation: DE = Direct Effect, IDE= Indirect Effect, U = Unanalyzed, S = Sporious

Table 9. Calculation results of path testing, and the indirect effect of the independent variable on the dependent variable with the path equation

4.2.4. Conclusion of the Calculation Results

From these calculations, the total value of Direct Effect, Indirect Effect, Unanalyzed, and Spurious for each path corresponds to the results of the simple (Pearson) correlation coefficient (Pearson). Thus, it can conclude that the proposed model and the analysis carried out are correct. The results of path analysis in this study have proven a causal relationship between digital literacy, self-awareness, career planning of students, and their learning achievement. From all hypothesis testing, it can be concluded that:

1. Digital Literacy and self-awareness have a direct and significant effect on career planning, both individually and collectively. The contribution of digital literacy and self-awareness to the career planning of prospective TVET teacher-students is 42.8%. Meanwhile, other factors that affect the career planning of TVET students are 58.2%.

2. Digital Literacy and self-awareness, and career planning, either individually or simultaneously, directly and significantly affect learning achievement. The contribution of digital literacy and self-awareness and career planning to the learning achievement of prospective TVET teacher-students is 50.9%. In comparison, other factors that affect the career planning of TVET students are 49.1%.

3. There is a direct and indirect effect between digital literacy and learning achievement through career planning. The total impact of digital literacy on learning achievement is 0.33. The direct effects is 0.263, and the indirect effect through career plans is 0.068. Thus, the indirect effect of digital literacy on learning achievement is more dominant than the indirect effect through career planning.

4. There is a direct and indirect effect between self-awareness and learning achievement through career planning. The total effect of Self-awareness on learning achievement is 0.4809. Of this total, the direct effect is 0.345, while the indirect effect through career planning is 0.1359. The direct effect of Self-awareness on learning achievement is more dominant than the indirect effect through Career Plans.

5. Discussion

This study found that the level of digital literacy of students (prospective TVET teachers) was in a fairly good category with an average score of 71.87 and 72 from a rating scale of 100. For the record, this research data was taken when the Covid 19 pandemic had not yet occurred (in 2018/2019), were at that time, learning on campus was still carried out face-to-face (offline). This finding is in line with Salim, Basri, Husain, Hidayah & Nurhayati (2020) results at Halu Oleo University, which in the dimension of access to the use of digital literacy for students is categorized as good enough at 54.83%.

This study also proves that digital literacy has a significant direct effect on student learning achievement and indirectly through student career planning. This finding is in line with Giovanni's research in senior high schools in Bogor City, West Java. Giovanni and Komariah (2020), through their research, proves that there is a significant relationship between digital literacy and student learning achievement as measured by information competence, communication competence, content creation competence, and security competence. However, this study is not by the findings of Effendi, Bustanur and Mailani (2019), they proved no effect of digital media literacy on student achievement in the Islamic Religious Education study program at the Islamic University of Kuantan Singing. This condition is in line with the findings of Tomczyk (2020), who researched issues related to digital literacy for 450 teachers. The results show different matters associated with the digital literacy of pre-service teachers.

In line with that, Perdana, Yani, Jumadi and Rosana (2019) found that students' digital literacy skills vary based on their education level. Meanwhile, Liu, Tretyakova, Fedorov and Kharakhordina (2020) found that school teachers and lecturers from universities have achieved a higher level of digital literacy than ordinary people. The findings of the previous researchers indicate that it is still rather difficult to generalize from

the results of this study. Although this research data is in the normal category, the digital literacy significance value is 0.057, only slightly larger or almost the same as the acceptance criteria for data normality of 0.05. An academic argument that it might explore is whether digital literacy has anything to do with educational background. In addition, the ability of each individual to access and own digital devices can also be the cause of these differences. Pratolo and Solikhati (2020), through their research, found that teachers who were considered digitally literate were found to have some difficulties in practicing digital literacy. Complications are mainly caused by external factors, such as lack of technology resources and limited school funds to purchase technology.

Thus, the digital-based learning process must again become the main issue of education. Digital learning that is integrated with the curriculum does develop not only hard skills in using digital technology but also soft skills on the ethics of cooperative discipline and can grow students' self-awareness to become human learners so that it has an impact on their learning achievement (Yanzi, Hidayat, Mentari & Budimansyah, 2019).

The next finding is about students' self-awareness. This study found that students have Self-awareness in the good category. Then it was also proven that there was a significant direct and indirect effect of student self-awareness on their learning achievement. The indirect effect is through career planning. This finding follows the findings of Mahaputri (2016), who proved that awareness-raising techniques in teaching reading have a significant impact on reading achievement. The theoretical explanation of this finding may be able to use Bandura's theory. According to Bandura and Schunk, as quoted by Maison, Kurniawan and Anggraini (2021), the mutually deterministic personality structure places everything that interacts. At its center is the self-system, which refers to cognitive systems and then guides the mechanisms and functions of perception, evaluation, and regulation of behavior. So, if the role of perception and assessment is good, the behavior that appears, especially awareness in learning, will be positive (Maison et al., 2021).

Kreibich et al. (2020) stated that self-awareness plays an important role in identifying students' barriers to learning in higher education. It is a rational argument for the close relationship between self-awareness and significant student achievement. If the reflection is defined as self-monitoring, then according to the results of Tolentino's research, there is a positive relationship between career adaptability and job search self-efficacy through self-monitoring of students who are more diligent in academic activities (Tolentino et al., 2019). However, self-awareness is defined by knowing oneself and reflecting. Self-reflection as a core concept of self-awareness is an evaluation process that requires an accurate perception of one's strengths and weaknesses to be projected against the challenges faced by individuals. The main challenges for students are being successful in learning and the ability to adapt to development.

The next finding is that there is a significant effect between career planning and student achievement. The path coefficient pYX3 = 0.267 and the significance value is $0.007 \leq 0.05$. This finding is different from Oracion and Albina's finding, which shows that there is no significant relationship between student career aspirations and student academic achievement (Oracion & Abina, 2021). Nevertheless, this research is consistent with Apriansyah (2014), he found that there was a positive relationship between career planning and student achievement. According to Mohamed, Satari, Bakar and Yunus (2020), childhood has been identified as an important period for every child regarding career. The teacher's responsibility is to ensure that students have good career literacy. The main purpose of career education is to introduce careers and create awareness among children about the types of work (Mohamed et al., 2020). Although Mohamed said in Early Childhood Education, the researcher believes that the issue is relevant to Vocational Education students.

Tran, Huynh, Giang, Nguyen-Thi and Nguyen-Thi (2020) examined the relationship between vocational orientation problems and career needs. Counseling from Vietnamese students proves a significant relationship between vocational orientation and the need for counseling in schools. Tran et al. (2020) explained that students need the help of school counselors to understand how to choose a career that suits their capacities, select a career-matching hobby, be independent and self-controlled in choosing a

career, and select a career career-matching social. Career choices are important for students because all types of jobs have several minimum competency requirements that prospective workers, including students, must meet. Students' perceptions and understanding of job literacy, namely the kind of work and competencies that are very requirements, can choose or determine the right career. Good self-awareness and adequate job literacy will encourage students to make maximum efforts in preparing themselves to fulfill the needs of the career they choose.

It also found that the direct effect of digital literacy, self-awareness on learning achievement was more dominant than the indirect effect of career planning. The rational argument is the researcher's statement that information technology students are used as tools and learning resources, namely accessing, selecting, collecting, and evaluating the information on science and technology according to the field of science they are engaged in. For self-awareness, the argument results from Kreibich et al. (2020), which shows that self-awareness plays an important role in identifying learning barriers. These can use these two arguments to support the results of this study.

Thus, in general, the results of this study are very relevant to the government policies regarding universities in the context of facing the 4.0 Revolution. According to Damayanti, the government requires universities to improve the competence of graduates in 3 areas, namely data literacy, technology literacy, and human literacy (Damayanti, 2021). Therefore, this relevance can be used as an advantage and a novelty of the research compared to other previous studies.

6. Conclusions

This study had three purposes: (1) Analyze the direct and indirect effects of digital literacy and self-awareness on student learning achievement. (2) Analyze the direct effect of digital literacy, self-awareness on student career planning. (3) Analyze the indirect effect of digital literacy and self-awareness of student achievement in the Faculty of Engineering, State University of Jakarta. This study found that (1) Digital Literacy and self-awareness, and career planning, either individually or simultaneously, directly and significantly affect learning achievement. The contribution of digital literacy and self-awareness and career planning to the learning achievement of prospective TVET teacher-students is 50.9%. In comparison, other factors that affect the career planning of TVET students are 49.1%. (2) Digital Literacy and self-awareness have a direct and significant effect on career planning, both individually and collectively. The contribution of digital literacy and self-awareness to the career planning of prospective TVET teacher-students is 42.8%. Meanwhile, other factors that affect the career planning of TVET students are 58.2%. (3) There is a direct and indirect effect between digital literacy and learning achievement through career planning. The total impact of digital literacy on learning achievement is 0.33. The direct effects are 0.263, and the indirect effect through career plans is 0.068. Thus, the indirect effect of digital literacy on learning achievement is more dominant than the indirect effect through career planning. There is a direct and indirect effect between self-awareness and learning achievement through career planning. The total effect of self-awareness on learning achievement is 0.4809. Of this total, the direct effect is 0.345, while the indirect effect through career planning is 0.1359. The direct effect of self-awareness on learning achievement is more dominant than the indirect effect through Career Plans.

The implication of this study is that more emphasize should be placed to digital literacy and self-awareness as these are factors that affect student learning achievement. Curriculum should accommodate information and communication technology skills learning to promote digital literacy. While learning students are exposed to ICT tools that facilitate and help their learning. In learning, activities should also be designed to encourage students to reflect for self-awareness.

Finally, the issues raised in this study: digital literacy, self-awareness, career planning, and learning achievement, are all important factors in educational innovation efforts to answer the challenges of changing job characteristics in the industrial environment due to the Industrial Revolution 4.0.

7. Recommendation

1. Further research is needed on digital literacy, self-awareness, career planning, and learning achievement among students and students in non-educational study programs and vocational schools.

2. To help students to be able to choose jobs that match their talents, interests, and competencies, career planning research needs to be deepened among students and students with the addition of job literacy variables.

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