

Teachers' and Students' Perception on Technology: Tool Literacy in Education of Two Senior High Schools in Bogor

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ABSTRACT

Inasmuch as today's education system needs to adapt with the global trend of technology, teachers and students have to put forward the embrace of technology by having deeper understanding in information literacy, specifically in tool literacy. The research focuses on elucidation of tool literacy of actors in education toward the use of technology. Moreover, it aims at identifying the perceived success of technology use in education. The research was done at two high schools, namely SMA Plus YPHB and SMAN 4 in Bogor City, West Java, Indonesia. This research also integrated mixed methods—qualitative and quantitative—which used questionnaires and interviews by incorporating Extended Technology Acceptance Model (TAM) using path regression analyses. The subjects of the research are teachers and students, an education practitioner, and an educational policy consultant. Furthermore, the assessment was done toward the perceptions of electronic tools, such as computers/laptops, Internet, software application and websites. The results show that teachers and students are motivated in using the devices in case they perceive that the tools are easy and simple. Thus, the research recommends the government devise teaching and learning applications based on the aspects of user-friendliness, namely uncomplicated and orderly design, and reliable features toward errors.

Keywords: Perception, Information Literacy, Tool Literacy, Bogor City, Senior High School Teachers and Students

1. INTRODUCTION

Multimedia-based education has been central to the current education system. Not to mention, industrial revolution 4.0 has been considered to have resulted in disruptive technology, notably in the education sector. Transforming education 2.0 which is based on standardization using conventional mechanisms to education 4.0 which is technology-based education scheme involving a plethora of sources to find the information. Moreover, it is not only thinking of how the government needs to procure the technology infrastructure in the schools, but it is also crucial to understand whether the teachers and students can catch up with the technology-enabled learning process, what so-called digital learning [1]. Another problem which also occurs is the surveillance and the frequency in integrating the technology in the classrooms. A survey conducted by Hewlett-Packard National Technology Readiness Assessment (NETr) in Bogor city shows that 85% of students in 33 schools access mobiles in the class without being monitored by the teachers [2]. What is more, only 33% of interviewed teachers in 33 schools in Bogor city accessed the internet only sometimes in a month which is deemed to be infrequent [2].

Inasmuch as today's education system needs to adapt with the global trend of technology, teachers and students

have to embrace and accept the new technology by having deeper understanding in information literacy, specifically in tool literacy. Additionally, tool literacy is the capability of utilizing the electronic resources [3]. As a matter of fact, technology is regarded to be able to boost the Student-Centered Learning (SCL) [4]. In addition, it denotes that SCL is central to acknowledging each student's need and style to understand the equitable process of learning in the schools [4]. It is, then, deemed to be one of the known factors to promote interactive learning which promotes engagement between students and teachers to actively learn together rather than teachers' spoon-feeding the students [5].

In addition to the use of technology, Covid-19 pandemic has also been reinforcing its use in teaching and learning activities which, in fact, are conducted at home and bring about some technical challenges for both teachers and students [6]. What is more, there are two obstacles encountered by Indonesia's schools today. First of all, the equity of developing the Internet infrastructure is crucial to promote technology-based education in Indonesia since it is still lacking infrastructures. In addition to the infrastructure development, Reily [7] argues that the Ministry of Communication and Information through the Telecommunication and Information Accessibility Agency (BAKTI) taking Palapa Ring project shows the percentage of 56% in

developing Internet infrastructure in Indonesian schools. Secondly, in actual practice, the schools' teachers need to also adapt to the changing technology in order to be able to transfer the knowledge to the students [8].

Therefore, this research was conducted to have a clear investigation of teachers and students' acceptance toward technology. Also, this leads to their ability in operating the electronic devices corresponding to tool literacy. Since the surge of technology has been far-reaching until the aspect of education, it is essential to understand the admittance of the teachers and students on the technology in order to better implement the technology in an educational setting. Moreover, it is also crucial to conduct such a study to comprehensively know the perceived success of the implementation of technology in education through teachers' and students' understanding towards tool literacy.

1.1. The Application of Technology Acceptance Model (TAM) in Education Context

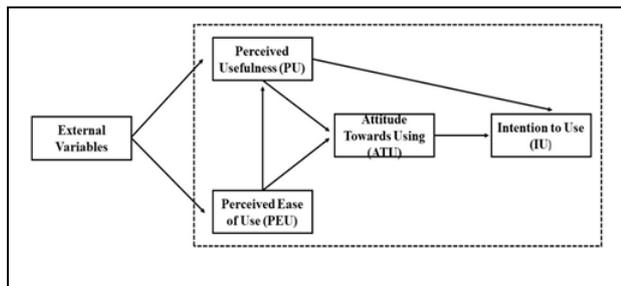


Figure 1 Technology Acceptance Model (TAM) [9]

The model has been used throughout years to analyze how important people's acceptance of technology use in the system. In fact, people have a tendency to accept and reject information technology due to two aspects, namely its ease and the positive attitudes [9]. What is more, it has been divided into four aspects, such as Perceived Usefulness (PU), Perceived Ease of Use (PEU), Attitude Toward Using (ATU), and Intention to Use (IU). Most importantly, there have been external variables extended to understand whether they influence the internal variables. First, PU lies importantly on how practical and functional information technology improves their everyday work. Secondly, PEU centralizes on how effortless the information technology is used by people [9]. In the later research, there are two added aspects that bring about the actual use of information technology, such as Attitude towards Using and Intention to Use. Third, ATU brings about their intent to use the technology in a system [9]. At last, IU explained that the users have subjective probability which has an impact on their behavior. As a matter of fact, this is central to users' interest toward information technology applied in a system [10]. At last, the elaborated aspects are presented in Figure 1.

Since TAM has been harnessed to understand the relations among variables to determine one's acceptance

over technologies, there have been many studies conducted to see its application in educational settings. A research presented shows that teachers and students will perceive the intrigue to utilize the technology which leads to the better intention provided they have perceived that the tools are convenient and useful for them [11]. What is more, this is also affirmed that Perceived Ease of Use (PEU) is still the main factor that shapes the usability of technological devices when it comes to applying it not only in education but also in communication [12]. Similarly, global students incline to harness technology when they perceive it easy and effortless to use, which can lead to positive attitudes in using the devices in their learning process [13]. Moreover, it is further confirmed that teachers are necessary to understand that providing their students are assigned to use technology-enabled learning, they need to pay attention to the aspects of effortlessness and the convenience [14].

Nevertheless, another research elucidates that Perceived Usefulness (PU) and PEU better shapes the ATU when it comes to harnessing the online application, and PU gives stronger contribution than PEU [15]. Also, it is supported by another study which explicates that pre-service teachers have strongly positive ATU when using the tools as long as they perceive that the devices are useful for teaching reasons [16]. Furthermore, these two studies correspond to the research that explains students have significantly optimistic perspectives toward using technology in case their teachers have constructed the idea that technology is useful for learning activities and process [17]. Due to the fact that PU influences the ATU and IU, Massive Open Online Course (MOOC) conducted for students' assessment has positive effects on students' IU inasmuch as the scheme is useful for their learning purposes [18].

1.2. The Extended Technology Acceptance Model (TAM) in Education Context

To begin with, Technology Acceptance Model (TAM) that was proposed by Fred Davis in 1989 has been a commonly used model for forecasting and explicating the used scheme or system [19]. Not only has the model been used for decades in predicting the system of technology acceptance, but also there have been numerous studies taking TAM by extending the scheme to see more influences corresponding to the selected external variables [19].

In respect of understanding the acceptance of technology in the educational setting, the three external variables for teachers are added like age, gender, and length of working experience. As for students, there are only two external variables added, such as age and gender. At first, age is deemed to be one of the determiners that facilitates users' IU, teachers and students, and their use of technology [20]. What is more, based on a study, age matters a lot in perceiving whether a technology is seen as a threat which generates anxiety

or not [21]. Therefore, age is included in this investigation to see its influence toward the factors.

Secondly, gender is determined to be another external variable of the model for both teachers and students. The issue of gender gap in using the technology in the classroom has been emerging since then, and this has been questioned in various studies. In fact, the investigations about users' gender and technology utilization have raised the issue that more female users incline not to be exposed to the technological devices in their pedagogical practices compared to those male teachers [22]. Additionally, the gender divide in using technology in educational settings was also examined with the result that more male users work well in using technology for completing their tasks [23]. Thus, gender is taken in this paper to understand its effect on other variables.

Thirdly, length of working experience, which is only examined for the teacher's side, is added as the next external variable in the scheme. Even though teachers have got twenty years of working experience in teaching, the technological gap is still felt to be a day-to-day problem due to even a very slight approach done by the teachers [24]. Moreover, the result of a research found that there is a relation between the use of technology and teachers' years of experience [25]. Although teachers have been experienced in teaching for decades, they are still necessary to be well-trained when it comes to using technology in a classroom setting to attain its objectives [26]. Hence, length of working experience is taken as one of external variables on teachers' side. Lastly, the models are presented in Figure 2 and 3, as follows:

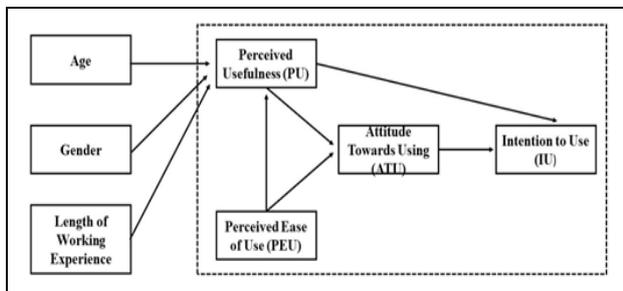


Figure 2 Extended TAM Model for Teachers [9]

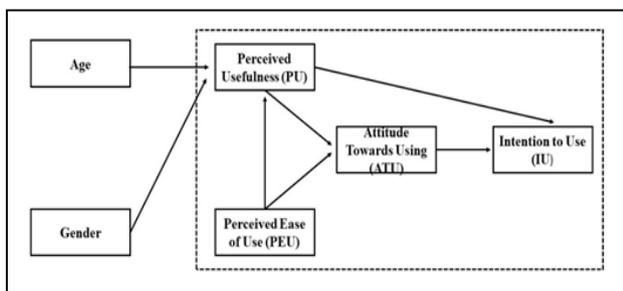


Figure 3 Extended TAM Model for Students [9]

1.3. Path Analysis

Path analysis is usually used when the research wants to see the relations among variables studied. This usually takes the relations among the independent variables which presents the causality which generates “direct and indirect effect on a dependent variable” [27]. In addition, this kind of analysis was taught by Sewall Wright in 1918 whose scheme has been very much embraced to explain the physical and social phenomena. What is more essential is that there are many other terms attributed to path analysis, such as analysis of covariance structures, causal modelling, and latent variable models [27]. Moreover, regression analysis is typically applied when it comes to understanding predictive analysis. Additionally, the usage is to know whether the predictor variables have contributed significantly to the outcome variable, or the predictor has done well in estimating the outcome variable [28].

2. RESEARCH METHOD

2.1. Data Collection

Data collection in this research uses two techniques, namely questionnaires and interviews. First, the online-based questionnaire using Google form was carried out by using the instruments which were elaborated using several questions in SMA Plus YPHB Kota Bogor. Moreover, the paper-based questionnaire was performed in SMAN 4 Kota Bogor. Then, the questionnaires were distributed among students and teachers, meaning the questionnaires were distinctive between teachers and students, and it was translated into Bahasa Indonesia. Additionally, it integrated the questions and responses which have been illustrated in Likert scales. Secondly, the interview was done using a semi-structured interview method.

To begin with, the teachers' questionnaire contains 39 questions, based on the Technology Acceptance Model by Fred Davis [9] for four aspects encompassing PEU, PU, ATU, and IU taking a 10-point Likert scale ranging from “strongly agree” to “strongly disagree”. Furthermore, with reference to the model, the author added several questions as the research instruments tailored to the current state of teachers and students' perception toward electronic resources in two schools taking Technology Acceptance Model by Fred Davis [9]. Secondly, the questionnaire for teachers and students are distinctive since the desired responses are also different. Moreover, the researcher provided another questionnaire that was distributed among students with similar instruments taken from TAM by Fred Davis [9]. As a matter of fact, this research incorporates a questionnaire comprising 32 questions for students' responses.

This research also incorporated a semi-structured interview with an education practitioner who is influential in Indonesia's educational scheme and educational technology and an education policy

consultant who has been involved in developing technology-enhanced learning. In fact, semi-structured interviews integrate a mix of open- and closed-ended questions that are frequently followed by why and how questions whose function is to provide follow-up inquiries from the open-ended questions [29]. Further, there were thirteen questions asked to the interviewees that were translated into Bahasa Indonesia.

2.2. Research Participants of Study

The participants are teachers and students at SMA Plus YPHB Kota Bogor and SMAN 4 Kota Bogor and an education practitioner and an education advisor in order to provide triangulation in retrieving the data. Additionally, Oslen [30] argues that triangulation is the mixing of methods which take more than two viewpoints leading to the data balance. Moreover, the teachers were selected by using nonprobability sampling. What is more, the students were also selected by using nonprobability sampling from three different batches which were expected to represent the population in the two schools. The data is presented in Table 1 and 2.

Table 1 The total population and samples in SMA Plus YPHB Kota Bogor

Subject	Population	Sample
Teachers	49	30
Students	608	69

Table 2 The total population and samples in SMAN 4 Kota Bogor

Subject	Population	Sample
Teachers	58	33
Students	937	93

2.3. Data Analysis

This research used quantitative and qualitative methods for data analysis. The quantitative analysis incorporates descriptive analysis which uses tables and graphs and inferential analysis which uses regression analysis. The data are retrieved from the result of distributed surveys from teachers and students based on the calculation using SPSS and Microsoft Excel. In fact, quantitative research “describes the methods of explaining an issue or phenomenon through gathering data in numerical form” [31]. Moreover, the surveys will be conducted to retrieve detailed data from the existing phenomenon of the teachers and students’ perception toward electronic tools.

At second, content analysis taking qualitative research to further explain the quantitative data and the interview was conducted with an education practitioner and an educational policy advisor. As a matter of fact, qualitative research is defined as “involving interviews,

documents, and observation in order to understand and explain a social phenomenon” [32]. Moreover, this research takes the semi-structured interview which usually uses the closed- and open-ended questions. These questions are commonly followed by some follow-up questions, such as how and why questions [29]. What is more, this technique is very usable in mixed method research to complement and support the finding of the study [29].

Further, the research paradigm will be positivism meaning the data are dependent on “quantifiable observations that lead to statistical analysis” [28]. At last, the research will see the Technology Acceptance Model by Fred Davis [9] to address the current state of teachers and students’ perception toward digital tools in the two schools pertaining to its perceived success.

2.4. Validity and Reliability Testing

For the questionnaires, the questions for both teachers and students have undergone the step of validity and reliability testing using the application of SPSS. At first, the teachers’ questionnaire was tested using Google Form, and the samples taken from 30 active senior high school teachers, the participants of EPIC and SOAR teacher’s training under the US Embassy. Then, the data proceeded taking Pearson’s product-moment correlation on SPSS. Based on the calculation of validity testing that has been done, it was derived that 39 questions of teachers’ questionnaires were all valid.

Secondly, the students’ questionnaire has undergone validity testing using Google Form. Moreover, the sample was taken from the students in SMA Plus YPHB Kota Bogor class XII MIPA 2 whose number of students were 26. As a matter of fact, the validity testing made use of Pearson’s product-moment correlation on SPSS. It was known that only 32 out of 37 questions were valid.

The reliability testing in this research used the formula of Alpha Cronbach supported by SPSS. Additionally, both teachers’ and students’ questionnaires underwent the testing using SPSS. First, the teachers’ questionnaire gained the value of 0.971 which showed that all questions indicated excellent and highly reliable. Secondly, the students’ questionnaire got the value of 0.958 which examined that the questions were also considered excellent and highly reliable.

3. RESULT AND DISCUSSION

3.1. Teachers’ Perception on the Implementation of Technology in Education

The data corresponding to teachers’ intention towards the use of educational technology infrastructure in the two schools are mostly influenced by the variables of PEU, PU and ATU (Figure 4). However, the external variables like age, gender, and length of working experience are not influential in determining PU.

Besides, it has been a very good start to know the teachers' perception upon the utilization of technology when it comes to teaching activities in class. What is more, education in Indonesia needs to shift from Education 2.0 which takes the conventional scheme of standardization and one-for-all system to Education 4.0 which is technology-based and uses various sources of information (Anonymous, personal communication, August 29, 2019). By making use of current trends, teachers can obtain many benefits, such as having better class conditioning and material transfer and having efficient time to work on (Anonymous, personal communication, August 6, 2019).

As presented, Perceived Usefulness (PU) is knowingly shaped by Perceived Ease of Use (PEU). Additionally, PU is translated into the acceptance of a better and faster system in use, and PEU is defined as the intensity of autonomy in making use of technology [33]. The teachers will see how convenient the technology is when they operate it autonomously without assistance. Thus, when the technology is perceived as an effortless tool to operate, they tend to acquire more usefulness in it [33].

Furthermore, PU and PEU influence ATU (Figure 4)—whether the teachers favorably or unfavorably accept the devices [12]. In other words, the attitude of the teachers is optimistic if they realize that the devices are useful and effortless. With reference to the findings, PEU has a greater impact on shaping ATU, but PEU has less effect on influencing ATU. Additionally, this signifies that teachers have a positive attitude towards the usability of technological devices when they can operate, navigate, and control the devices easily. In actual practice, the devices can result in teachers' positive attitudes if it can ease the teachers' responsibilities, such as quickly assessing students' assignments and accelerating the learning process (Anonymous, personal communication, August 6, 2019).

Moreover, PU and ATU also influence IU (Figure 4). Here, the intention of teachers to use devices is better determined by the attitude, and the attitude is further affected by the ease of use. This is interpreted that the convenience and ease of devices can result in positive attitudes, and the positive attitude preferably influences constructive intention in making use of the devices. What is more, the intention of using technology like tracking the students' learning progress and competence can be optimistically understood if there are systematics and the approaches to integrate the technology in teaching and learning activities. Also, this needs to be in line with the goal of providing quality education for all (Anonymous, personal communication, August 29, 2019).

Ultimately, the external variables, such as age, gender, and length of teaching experience do not have a knowing effect on PU (Figure 4). First, age does not affect PU—regardless how old the teachers are, they perceive the technology in teaching is useful because it is still possible for senior teachers to have better

understanding towards technology compared to the young teachers or vice versa (Anonymous, personal communication, August 29, 2019). Besides, in current practice, gender does not have an impact on PU, and it has been considered neutral in case of perceiving the usability of technology in this research. Moreover, the length of teaching experience does not also shape PU in this research—regardless how long teachers' teaching experience is, they perceive that making use of technology is useful for delivering the materials. Essentially, teachers have to have technological knowledge to be able to operate, manage, control, and be responsible for utilizing technological devices regardless of age, gender, and length of teaching experience (Anonymous, personal communication, August 6, 2019).

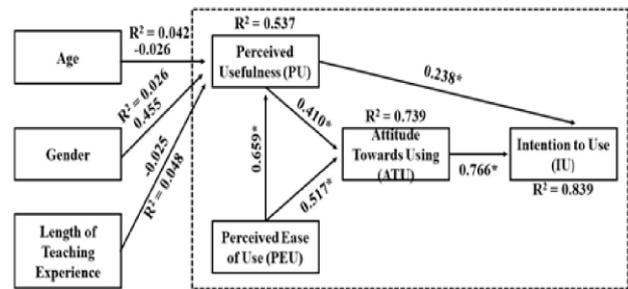


Figure 4 Results of Teachers' Perception on the Implementation of Technology in Education

*: denotes significant difference $p < 0.05$

3.2. Students' Perception on the Implementation of Technology in Education

The data presents the influence of PU, PEU, and ATU upon IU and the effect of external variables, such as age and gender toward PU over the students in the two high schools (Figure 5). Moreover, technological devices have been central to making further improvement for the students since they have been experiencing using the tools on a daily basis (Anonymous, personal communication, August 6, 2019). It is also confirmed that since today's students have a high ownership over the technological devices, they are more likely to be advanced in operating them [34].

First, the relationship between PEU and PU over the students from the schools is significantly perceived (Figure 5). The convenience and the user-friendliness can affect students' perceived usefulness towards technology. In relation to this, a study conducted in grade 10 Australian students over the use of the Internet in science and math classes, there are four disadvantages comprising the difficult way of searching for the wanted information on websites, inefficiency, the need of regular assistance, and errors [35]. Therefore, the provided resources need to ease students' work upon their learning process since the ease of usability does not consume much time while using [36].

Secondly, the variables tested are PU and PEU upon ATU (Figure 5). In addition, students' attitude towards using the devices is significantly shaped by PU. The ease of using the devices determines the positive attitudes among students in the learning process. By assigning students some tasks using the approaches that they have applied on a daily basis like making YouTube videos or Instagram posts can result in positive attitudes (Anonymous, personal communication, August 6, 2019). Because of this, they find it uncomplicated to use and operate; hence, they are more likely to have positive attitudes while submitting the task [17].

Third, the influence of PU and ATU was tested over IU toward the students of the two schools (Figure 5). In addition, the students' positive attitudes toward utilizing technology better shapes their intention in using it compared to their perceived usefulness. In this case, personalized learning is applicable to build students' optimism in their learning progress like making a vlog which technology is autonomously used to search for various sources of information (Anonymous, personal communication, August 29, 2019).

Lastly, this research also examined the influence of the external variables like age and gender upon PU (Figure 5). The result showed that age has an impact on determining perceived usefulness of the students. Nonetheless, gender is neutral. Since age shapes PU, the more senior the students are, the less useful they perceive the technology. What is more, the senior students—12 graders—will perceive that the technology is less useful compared to those in 10 and 11 grades. This condition occurs because the seniors are likely to concentrate more on school's completion without a national exam in this pandemic era [37].

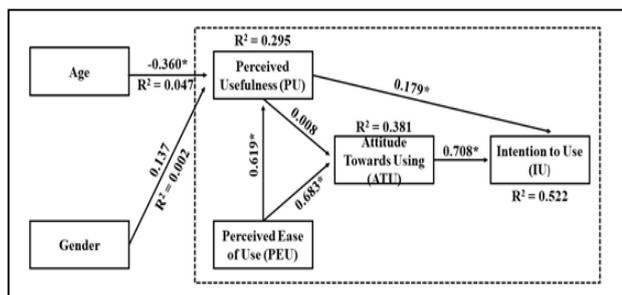


Figure 5 Results of Students' Perception on the Implementation of Technology in Education

*: denotes significant difference $p < 0.05$

4. CONCLUSION AND POLICY RECOMMENDATION

4.1. Conclusion

Based on the finding and discussion in this research with TAM model and its variables and the external variables, it is concluded that teachers and students' Perceived Usefulness (PU) is better determined by Perceived Ease of Use (PEU) in both SMA Plus YPHB

and SMAN 4 Kota Bogor. This condition explicates that the easier the new technology is, the more useful teachers and students perceive it to apply in the actual practices. Moreover, the Attitude Toward Using (ATU) is mostly shaped by PEU rather than PU in the schools. In addition, this explains that teachers and students will obtain positive attitudes in case they consider the new technology as simple and effortless tools to integrate. Finally, the Intention to Use (IU) is significantly affected by ATU in both schools. This elucidates that teachers and students have an intent to incorporate the new technology provided they have positive attitudes in utilizing it in the classrooms. Then, gender is considered neutral for both teachers and students, and length of teaching experience does not shape PU for teachers. Nevertheless, age influences PU of students, but teachers in the two schools.

4.2. Policy Recommendation

In respect of the conclusion above, there are some policy recommendations able to be proposed:

1. When the government wants to create online platforms for teachers and students, they need to pay attention to the aspect of user-friendliness: uncomplicated and orderly design and reliable feature toward errors.
2. The government needs to understand the regional context when it comes to implementing the technology as a means of learning, because each region has diverse needs toward technology.
3. The government needs to perform the assessment for addressing technological readiness of the schools by looking at the competence of the teachers, principals, students, and other technical supports instead of doing assessment upon the administrative documents.
4. The government and schools need to be open-minded in making a collaboration with the communities that are specifically active in providing teaching development programs in order to conduct impactful training based on the schools' characteristics and socialize the platform that the government has designed.

AUTHORS' CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Jordy Satria Widodo, Novia Budi Parwanto and Safendri Komara Ragamustari. The first draft of the manuscript was written by Jordy Satria Widodo and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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