Mathematics, Science and Social Science teachers’ acceptance of online teacher professional development: Does internet accessibility matter?

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Abstract. In Indonesia, teacher professional development has been enhanced through the teacher certification program that requires them to take online courses. However, Indonesian teachers’ acceptance toward online teacher professional course has not been revealed. This study aimed to identify teachers’ perception of the online course according to internet accessibility. It employed a quantitative approach with a cross-sectional survey model. With total population sampling technique, 257 mathematics, science social science teachers participated in the survey. The survey instrument was developed based on the technology acceptance model, which include online learning self-efficacy, subjective norm, system accessibility, perceived usefulness, perceived ease of use, attitude, and behavioral intention to use. The questioners were distributed and responded through online questionnaire. Data were analyzed quantitatively, and the result shows that the participants have a positive perception on the online course. In addition, their perceptions were influenced by internet accessibility. This finding indicates that the policymaker needs to pay attention to internet accessibility at schools.

1. Introduction

The 4.0 industrial revolution has changed the way people work in various fields including, education [1]. This revolution is a combination of cyber-physical systems, the Internet of Things (IoT) and the internet of system [2]. IoT plays important to make lives easier as the internet can be used according to user’s need. However, IoT still leaves room for improvement, particularly is an aspect of human condition and feeling. This is the main reason why Interned of People (IoP) is needed [3]. IoP emphasizes the strong interaction between users with all their characteristics and local dimension [3,4]. IoT and IoP have implication in education that is education stakeholders need to pay attention to teachers when they integrate technology in the classroom.

IoT and IoP are expected to create a generation that is aware of the quick development of teaching, particularly information technology. Children who grow up in the era of IoT and IoP generally have good skills in this technology. This condition leads to a great challenge for teachers if they are not equipped with this skill [5].
Teachers play a very critical role in the integration of ICT in the classroom. [6]. Therefore, it is a must for the teachers to improve their knowledge and skill. To achieve this aim, the Indonesian government provides continuing professional development for teachers which is abbreviated as ‘PPG program’.

In PPG program, teachers need to participate in several phases. The first phase is online courses on pedagogy and subject matters. Teachers use Brightspace platform called ‘PPG SPADA Brightspace’. According to research results [7], Brightspace is user-friendly and offers features that make it easy for instructors to control the platform.

Online learning professional development will be successful if participants have high acceptance of the technology. Therefore, it is important to understand to what extent teachers’ acceptance to PPG SPADA Brightspace. To understand this, we employ the Technology Acceptance Model (TAM). This theoretical model is important to understand and describe user intention and behavior in an online learning environment [8].

According to research results [9], teachers’ acceptance to technology is influenced by technology accessibility. In the context of PPG, to participate in the online learning phase, teachers need good internet accessibility. However, as the participants located in different areas, they do not have the same quality of internet connection.

To best of our knowledge, there is very limited study has been conducted to investigate teachers’ acceptance to online professional development according to internet accessibility. In addition, there is no report that has been published regarding PPG teachers’ acceptance of the online learning platform. Such information is important for policymaker in order to improve the online teacher professional development. Therefore, it is necessary to examine teachers’ acceptance to the PPG SPADA Brightspace according to internet accessibility.

2. Conceptual Framework
This study employed the TAM model, originally proposed by Davis in 1986. It is well-known model and has proven to be a theoretical model to explain and predict user behaviour in the use of information technology.

![Figure 1: First modified version of the Technology Acceptance Model (TAM) [10]](image)

The model provides a basis with which researchers can examine how external factor influence belief, attitude and intention to technology. According to the TAM model, users’ actual use of technology is influenced by one’s behavioral intentions, attitude, perceived usefulness, perceived ease of use.

3. Research Aim and Question
3.1. Research Design
This study employed a quantitative approach with a cross-section model [11]. We collect data once when the participants have been in training for about two weeks.
3.2. Research Participants
Total population sampling technique was employed in this study. Samples of this study were 257 teachers who participants in the first cohort of 2019 professional development. Samples of this study were mathematics, science and social science teachers. It took three months for the participants to complete the online professional development.

3.3. Research Instruments
We develop a questionnaire based on Park [8]. It consists of six scales, namely perceived ease of use (EU), perceived usefulness (PU), attitude (AT), behavioral intention (BI), online learning self-efficacy (SE), external variables (EV), dan accessibility (AC). To validate the questionnaire, we used convergent and divergent. Moreover, in terms of reliability, we utilized composite reliability and variance extracted value. Moreover, the instrument consists of 19 liker scale items ranging from strongly agree to strongly disagree.

3.4. Data Collection
To collect the data, we conducted a survey. We used an online tool for the survey as it is in line with the teacher online professional development. Moreover, the online survey is also easy to be administered and accessible with various devices [11]. The questionnaires were distributed after the participants have been experienced in using PPG SPADA Brightspace for three weeks.

3.5. Data Analysis
Data were analyzed descriptively. Data analysis took three phases. First, we grouped participants according to their internet accessibility at home and school. Second, we identified participants’ response regarding their acceptance of online learning professional development. Third, we categorized the data identified in the second phase according to participants’ internet accessibility. In this phase

4. Results and Discussion
In this section, we present results and discuss them as follows. First, we describe teachers’ internet accessibility at homes and schools. Second, we discuss teachers’ acceptance of the online professional development course according to their internet accessibility.

| Category                        | Accessibility | Frequency | Percentage |
|---------------------------------|---------------|-----------|------------|
| Home (personal use) (N=257)     | Owned         | 240       | 93         |
|                                 | Not owned     | 17        | 7          |
| School (N=257)                   | Owned         | 156       | 61         |
|                                 | Not owned     | 96        | 37         |
|                                 | No answer     | 5         | 2          |
| School Grade                    |               |           |            |
| Elementary School (N=37)        | Owned         | 12        | 32         |
|                                 | Not owned     | 25        | 68         |
|                                 | No Answer     | 0         | 0          |
| Junior High School (N=83)       | Owned         | 51        | 61         |
|                                 | Not owned     | 32        | 39         |
|                                 | No Answer     | 0         | 0          |
| Senior High School (N=117)      | Owned         | 78        | 67         |
|                                 | Not owned     | 35        | 30         |
|                                 | No answer     | 4         | 3          |
| Vocational High School (N=20)   | Owned         | 15        | 75         |
|                                 | Not owned     | 4         | 20         |
|                                 | No answer     | 1         | 5          |
Table 1 shows that most teachers have access to the internet at home or on a smartphone. According to Nafi [12], 28% of Indonesian people have use smartphone. Moreover, 10 million houses are connected to the internet [13]. Regarding the frequency of internet use, it shows that 93.9% of internet users internet access with smartphone every day [14]. These data indicate a high number of teachers who have internet access at home is dominated by their access to a smartphone. Moreover, it also indicates that policymaker and education stakeholder need to consider in the use of smartphone when they design and develop a platform for teacher and learning resources. On the other hand, the finding showed nearly half of the participants do not have internet access in their schools. When we look further details on internet accessibility according to the level of the school, it shows that primary schools have less access to the internet than other levels of schools. Teachers’ limited access to the internet at schools can impact teaching and learning process, particularly in the computer-based national examination.

According to Robandi et al. [1], there are several factors that hinder teachers from integrating ICT in the classroom, namely infrastructure availability, teachers’ limited knowledge [15], students’ readiness in the use of ICT and students’ characters. Regarding those factors, the findings show that lack of ICT facilities has hindered the integration of ICT in education in Aceh. It is in line with the previous study that showed that a lack of ICT infrastructure is the main barrier to technology integration [16]. Other external barriers to ICT integration are teacher’s lack of time, lack of training and supports from schools and policymaker [16,17]. According to Yulisman et al. [18], the Aceh government only focus on these external factors. However, it is not enough as the integration technology in the classroom also hindered by teachers’ internal factors such as teachers’ belief and attitude toward technology [18,19]. Niederhauser and Lindstrom [20] argued that the integration of ICT would not a success when teachers’ internal factors were ignored.

Table 2. Teachers’ perceptions about online professional development using PPG SPADA Brightspace

| Aspect | Statements                                                                 | Response (%) | 1* | 2* | 3* | 4* | 5* |
|--------|-----------------------------------------------------------------------------|--------------|----|----|----|----|----|
| EU     | It is easy to use PPG SPADA Bright                                            |              | 3  | 2  | 37 | 43 | 15 |
|        | It is easy to learn through PPG SPADA Brightspace                            |              | 2  | 5  | 40 | 39 | 13 |
|        | It is easy to acquire skills in the use of E-learning PPG SPADA Brightspace   |              | 3  | 5  | 38 | 42 | 12 |
| PU     | Learning through PPG SPADA Brightspace can improve my knowledge              |              | 4  | 1  | 30 | 35 | 30 |
|        | PPG SPADA Brightspace improve my productivity in academic                    |              | 3  | 2  | 32 | 46 | 18 |
|        | PPG SPADA Brightspace make me easy to understand a specific topic            |              | 3  | 3  | 34 | 40 | 20 |
| AT     | Learning through E-learning PPG SPADA Brightspace is a good idea            |              | 4  | 2  | 33 | 45 | 16 |
|        | Learning through E-Learning PPG SPADA Brightspace is a wise idea            |              | 3  | 4  | 35 | 46 | 14 |
|        | I have positive attitude toward E-learning PPG Spada Brightspace             |              | 3  | 1  | 30 | 41 | 25 |
| BI     | I will regularly check announcements on PPG SPADA Brightspace                 |              | 3  | 1  | 31 | 46 | 19 |
|        | I will always access PPG SPADA Brightspace                                  |              | 3  | 1  | 33 | 46 | 18 |
| SE     | I am very confidence in search information on PPG SPADA Brightspace           |              | 2  | 3  | 35 | 44 | 16 |
|        | I have sufficient knowledge to PPG SPADA Brightspace                        |              | 2  | 13 | 43 | 34 | 8  |
| EV     | E-learning PPG SPADA Brightspace is important for me                         |              | 4  | 1  | 31 | 40 | 25 |
I am pleased to use E-learning PPG SPADA Brightspace as it is in line with school and my vision
To improve my knowledge of teaching, it is important for me to learn through E-learning PPG SPADA Brightspace

AC
I don’t have difficulty to access and use E-learning PPG SPADA Brightspace at home
I don’t have difficulty to access and use E-learning PPG SPADA Brightspace at school
I don’t have difficulty to access and use E-learning PPG SPADA Brightspace at school in another place

Description: 1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree

Teachers’ limited access to the internet at school can be overcome by employing mobile devices as there is a larger number of Indonesian people (28%) who use smartphone [12]. Furthermore, the use of mobile learning in teaching and learning requires less infrastructure compared to the integration of other technology such as computers [21,22].

Overall, teachers have a positive view toward E-learning PPG SPADA Brightspace (Table 2). Teachers perceived that PPG SPADA Brightspace is easy to use and useful for improving teaching and learning. Moreover, teachers revealed that PPG SPADA could improve their knowledge and it is in line with their and schools’ mission. The finding of this study is in line with Liu et al. [23] that show that students had a positive attitude in learning when they used Brightspace online management system. The study also revealed that the use of the online platform had increased students’ learning achievement.

However, it shows different results according to internet accessibility (Figure 2). This indicates teachers rely on the internet connection provided by schools. In addition, it also indicates teachers are not able to capitalize smartphone for educational purpose.

![Figure 2. Teachers’ responses to online learning according to internet accessibility at homes](image-url)

Figure 2 shows that teachers have different perception toward online learning professional development in relation to their internet accessibility. It shows that teachers who have a better access to the internet have a better perception toward online learning. This indicates that the improvement of
internet accessibility will enhance teachers’ intrinsic motivation in online professional development. This aligns with Makki et al. [17] who argue that external factors influence internal factors in teachers’ use of technology. This finding is also in line with Yerdelen-Damar et al. [9] study that shows that access to internet infrastructure influences teacher’s self-efficacy.

The findings also show another interesting point that teachers with a lack of access to the internet have stronger behavioral intention to use the online resources compared to those who have good internet access. According to Huang et al. [24], behavioral intentions can be predicted through perceived usefulness. It indicates that teacher behavioral intentions in the use of technology influences by the ease of use of technology. Teachers have barriers in the use online learning platform if they do not have steady access to the internet.

The finding leads to several implications. First, policymakers and education stakeholders need to provide internet connection in all schools. So far, in Aceh, the government has implemented ‘smart city’ program to provide internet connection in schools. However, this program is intended to only vocational schools [18,25]. Second, the policymaker needs to provide ICT infrastructures that are accessible to teachers.

Figure 3 shows that there are differences in teacher perceptions toward online professional development according to their internet accessibility at school. It is interesting that teachers who have not internet access at school have higher perceptions toward almost all aspects except perceived ease of use, online learning self-efficacy, and accessibility. Regarding the aspect of ease of use, the finding indicates that teachers with and without internet access at home perceive PPG SPADA Brightspace is easy to use. This finding is in line with Huang et al. [24], that showed perceived usefulness influences behavioral intentions. It indicates that teachers with good access to the technology will have strong intention in the use of technology.

The findings indicate that internet accessibility plays important roles in teachers’ acceptance toward online learning professional development. Unfortunately, teachers’ lack of internet access remain happens in Indonesia, Aceh Province in particular. Lack of internet access has a strong effect on teacher perception toward online professional development. In the end, it will lead to unsuccessful in the teacher professional development program.
5. Conclusions
This study revealed that teachers have a positive view on online learning professional development through PPG SPADA Brightspace. However, a lack of internet access has hindered their acceptance to the platform. Therefore, it is very important to provide reliable internet access at schools to successfully implement teacher online professional development in Indonesia, particularly in Aceh province.

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