Exploring the mediator in science service learning: analysis of university students' behavioural intention to use digital platforms

Abstract

This study examined two mediators of university students' behavioural intention to use digital platforms in the context of science service learning in Taiwanese universities. Based on the technology acceptance model (TAM), we proposed two cognitive variables as antecedents, self-efficacy and science trust, to verify their influences on students' behavioural intention. We further investigated two mediators, perceived usefulness and perceived ease of use, to examine to what extent they had effects on students' intention. Questionnaire data were collected from 282 university students who participated in a science service project. A structural equation model (SEM) procedure was used to test the direct and indirect relationships between the variables. The results showed that both self-efficacy and science trust had direct influences on perceived usefulness and perceived ease of use. The two mediators also had direct effects on students' behavioural intention. Nevertheless, as a mediating variable, only perceived ease of use effectively mediated the relationships between both self-efficacy and science trust and students' behavioural intention. Findings of this research could provide some suggestions to enhance students' behavioural intention for institutions where science service learning is a required project/programme.

Keywords: science service learning, behavioural intention, self-efficacy, science trust, perceived usefulness, perceived ease of use

1. Introduction

Volunteerism and service learning in higher education have become increasingly important for students and their institutions in recent years (Routon & Walker, 2017; Theodore et al., 2018). Previous research internationally has found that when students participated in Science, Technology, Engineering, and Mathematics (STEM) activities which developed their related knowledge and skills, their intentions to further pursue related careers or studies also increased (Hernandez et al., 2018). Nevertheless, research has also pointed out the fact that some science fields have suffered from declining student interest (Tröbst et al., 2016; van Griethuijsen et al., 2015), and that there has been also a decline in participation in science service-learning programmes. It is therefore important to understand the factors that affect their behavioural intention (BI), which is an individual's readiness to perform a behaviour (Ajzen, 1985), and engagement in such learning (Coe et al., 2015; Li & Frieze, 2016).

A growing number of universities and non-profit organizations are now using digital platforms to recruit participants to support their projects (Saura et al., 2020). Digital platforms can be used as a medium to not only recruit members, but also provide information about service projects and as a communication forum. For example, ChanLin et al. (2015) have suggested that schools should adopt digital platforms to bridge students to social services and community engagement. More generally, service learning research that has adopted online or digital mediums in academic disciplines has focused on the benefits for the students and community residents (Bourelle, 2014; Soria & Weiner, 2013; Tracey & Kacin, 2014). Although digital platforms have advantages in service learning, recent studies have indicated that students' intention to use digital platforms was not as high as expected

compared to other technology-enabled learning in higher education (Gan et al., 2015; Yusof et al., 2019). The studies have indicated that students lacked positive engagement in service learning within online platforms, such as barely initiating or responding to online discussions. However, factors that influenced their use of digital tools in service learning were not investigated.

In Taiwan, the adoption of digital approaches in science service learning is still relatively low. Previous research on service learning mainly focused on university students' experiences with little reporting on the adoption of digital platforms in the program or curriculum (Chen, 2018; Lin et al., 2014; Liu & Hsiung, 2019). One study which employed an online platform (Facebook) in service learning for community networking and information exchange indicated that the digital platform raised the students' social reflection and professional awareness (Chen, 2019). Nevertheless, in this case, service learning took the form of a short-term project-based competition and the study did not investigate factors that influenced students' behavioural intentions on digital platforms. The other relevant study that incorporated an online platform for service learning pointed out its advantage for improving student learning outcomes in higher education (anak Marcus et al., 2021). By adopting an e-service learning platform with authentic issues, students could develop information-organizing skills and improve teamwork skills as well. Despite that, the study only examined the effects of the digital platform but students' behavioural intentions are still unknown.

With limited studies on university students' behavioural intentions on using digital platforms in science service learning, our research aimed to fill that gap in the literature. We examined the external cognitive and technology acceptance factors that influence students' intentions in an extended TAM model in the context of science service learning. By analysing the relationships among factors in our proposed model, our study could contribute to not only the theoretical understanding of factors but also the design of digital platforms and appropriate training plans in science service learning.

2. Literature review

Research on behavioural intention has received a considerable amount of attention in the last decade (Gonzalez & Ruiz, 2016; Greener, 2017; Malak et al., 2018). For example, some studies stated that self-efficacy (SE) was the strongest differentiating factor in behavioural intention compared to other cognitive-personal variables (Lin et al., 2018; Rabin et al., 2020). Students who have more confidence in their abilities are more likely to engage in certain fields. Nevertheless, there is still limited research on to what extent that self-efficacy would affect students' intention in science service learning, specifically within digital platforms.

Another factor that would influence students' behavioural intention is science trust (ST). Previous studies pointed out that science trust was a vital factor in reducing uncertainty in citizen science (Peters et al., 2017; Thornton & Leahy, 2012). This could imply that the more trust students have in science, the higher intention they would have to participate in science service learning. Therefore, in this study, we also included science trust as a cognitive factor in science service learning within digital platforms. However, the extent to which self-efficacy and science trust influence students' behavioural intentions in the context of science service learning remains unknown. Therefore, in this study, we would take these two variables as antecedents to examine their relationship to students'

behavioural intentions.

Besides students' cognitive variables, we have to also consider the factors associated with the digital platform itself. In the last decade, the technology acceptance model (TAM) has verified that "perceived usefulness" (PU) and "perceived ease of use" (PEU) have a fundamental influence on students' attitudes and intentions to use technology (Al-Emran et al., 2018; Lazar et al., 2020). These studies have supported the theoretical framework of TAM developed by Davis (1989). Also, Nami and Vaezi (2018), in their study of technology-enhanced learning, have confirmed that technology acceptance had a positive relationship with students' technology knowledge and experience. Hence, it is essential to include students' "perceived usefulness" (PU) and "perceived ease of use" (PEU) of digital platforms in the context of science service learning within the TAM framework.

Synthesizing from the above research findings, there are therefore several possible factors that can affect students' behavioural intention in science service learning within digital platforms, namely self-efficacy, science trust, and the elements of the TAM (perceived usefulness, and perceived ease of use). This study examines the relationships among these factors. It aims to explore an extended TAM model to verify the acceptance of science service learning through digital platforms in higher education. The variables of self-efficacy, science trust, perceived usefulness, and perceived ease of use are incorporated into our extended TAM model for the first time in a methodological framework. The outcomes of the study seek to provide an appropriate theoretical framework to examine university students' behavioural intentions and can be utilized for the development and evaluation of science service learning activities or the design of digital platforms. The following sections further elucidate related research that included the variables in our extended TAM model.

2.1 Self-efficacy

Self-efficacy refers to an individual's belief in their capacity to implement the necessary behaviours to achieve a specific performance (Bandura, 1977, 1999). Research on behavioural intention has also included self-efficacy, both conceptually and operationally known as perceived behavioural control, in the theory of planned behaviour (TPB) (Ajzen, 1991; Conner & Armitage, 1998). According to TPB, self-efficacy is considered a determinant of an individual's decision to enact a particular behaviour. That is, when people judge their own ability to complete a task, their willingness in achieving the goal can be reflected. Hence, it is important to include self-efficacy in our examination of students' behavioural intention of science service learning with digital platforms.

The inclusion of the self-efficacy construct in science learning has also been supported by recent relevant studies (Kao et al., 2019; Ucar & Sungur, 2017) which have found that self-efficacy is critical in promoting students' science interest and participation. Therefore, it can be regarded as one of the predictors of individuals' behavioural intention. Studies at other educational levels also indicated similar findings. For example, a previous study involving elementary students revealed that self-efficacy could affect children's actual usage of digital textbooks (Wang & Xing, 2019). Another study (Thongsri et al., 2020) examined academic major differences in e-learning which also pointed out that students' computer self-efficacy would affect their science learning intention. In the context of online learning, this may suggest that high student self-efficacy could be a critical factor in their behavioural intention. Notwithstanding, as an external factor, whether self-efficacy in science service learning would have direct effects on behavioural intentions in using digital platforms remains unexplored. Therefore, it is

included in our research model to examine its effects on university students' intention in the context of science service learning with digital platforms.

2.2 Science trust

In addition to analysing self-efficacy in our extended TAM model, science trust is another factor to be considered. The meanings of trust are diverse in different situations (Williamson, 1993). Trust is a term for the clustering of perceptions (White, 1991). In other words, trust is the generalized expectancy held by an individual regarding whether something/someone is safe and reliable (Hoff & Bashir, 2015). When it comes to trust in science, it is not only essential for scientists in carrying out their work, but also for the public dealing with science-related topics/activities in their everyday life (Feinstein, 2011). Trust in science is crucial for scientists in doing research and is fundamental for the general public in understanding science (Hendriks et al., 2016). There are many studies on trust in different disciplines, such as in business (Agag & El-Masry, 2016; Slade et al., 2015), economics (Becker et al., 2016), the management literature (Venkatesh et al., 2016), and the education domain (De Meo et al., 2017). In the context of science trust, Bijker et al. (2016) found that people would trust science when the personal, the technical, and the institutional domains were linked together. A meta-analysis by Wu et al. (2011) pointed out that there were more than 70 external variables for PU and PEU in TAM, and among these variables, trust is often proposed by researchers as an important factor (Yousafzai et al., 2007). In science-related domains, research also has indicated that trust is a pivotal factor in citizen science (Peters et al., 2017; Thornton & Leahy, 2012). Given the limited research in the context of science trust in service learning, to fill the research gap in this domain, it is vital to embed science trust in our extended TAM model. Therefore, we integrated ST as an external variable to investigate the influence on students' behavioural intention.

2.3 Technology acceptance model (perceived usefulness and perceived ease of use)

The technology acceptance model (TAM) is a theory in informatics that models how users come to accept and adopt a technology (Davis, 1989). It has been widely used to support e-learning acceptance or use. There are many studies based on the TAM model and research on exploring factors affecting people's use of technology has become an important research field. Teo et al. (2018) found that PU and PEU were the triggers for English teachers to use technology in teaching. Walker et al. (2020) also found similar results among practicum teachers' use of mobile technology. Besides the original TAM model, extended TAM models have also been developed and thoroughly examined. For example, based on the TAM model, Venkatesh and Davis (2000) further pointed out that determinants, such as technology experience, job relevance, and output quality, could influence people's usage intentions over time. Also, Tick (2019) evaluated university students' eLearning acceptance and the use of smart tools. The results showed that the external variables (ex. eLearning anxiety, digital learning, and smart tools) had an impact on students' behavioural intention to use, perceived usefulness, and perceived ease of use of the eLearning system. Sharma et al. (2016), in their study on the adoption of cloud computing, also verified that motivators such as self-efficacy and trust were effective in their extended TAM. Moreover, Abdullah and Ward (2016) in their meta-analysis of commonly used external factors of extended TAM, also pointed out that self-efficacy was one of the best predictors of students' PU and PEU of e-learning systems. Therefore, examinations of different social influences or cognitive factors on people's behavioural intentions have been widely investigated.

Synthesizing from the above-stated studies, we can see that self-efficacy could be a potential external variable in affecting students' PU and PEU. However, whether self-efficacy in science service learning would have direct

effects on behavioural intention in using digital platforms remains unknown. Although trust is often regarded as an important factor for PU and PEU, the influence of science trust in service learning on behavioural intention still needs examination. In addition to this, whether self-efficacy and science trust have mediation effects in our extended TAM also requires further determination. Our research would fill that gap in the literature.

3. Research purpose and model

Given the aforementioned main influencing factors in behavioural intention and technology acceptance, it is evident that there are research questions to be answered concerning science service learning within digital platforms. Hence, we aimed at examining external cognitive and technology acceptance factors in science service learning within digital platforms. Thereby the TAM model is extended by including self-efficacy and science trust as external cognitive constructs to explore the relationships among these factors. Figure 1 reveals the research model. More specifically, our purpose is threefold:

(1) To determine the extent to which self-efficacy and science trust have direct effects on behavioural intention to continue science service learning within digital platforms amongst a random sample of Taiwanese undergraduate students.
(2) To examine the influences of the mediators, "perceived usefulness" and "perceived ease of use", on these students' behavioural intentions in science service learning within digital platforms.
(3) To explore whether self-efficacy and science trust have a mediation effect on behavioural intention.

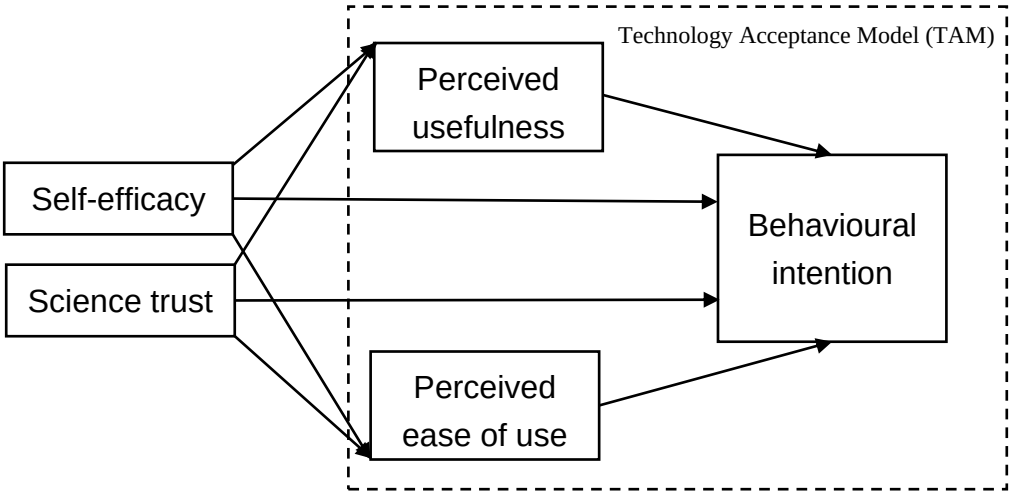

Figure 1. The research model

4. Research method

Before we examined the combined effects among SE, ST, PU, and PEU, we designed and tested the validity of the questionnaires via factor analysis. We then examined the direct effects of SE and ST on students' BI for science service learning within digital platforms. Then, we investigated the influences of the two mediators, PU and PEU, on BI. Lastly, the combined effects were determined for the extended TAM.

4.1 Participants

The sample was recruited through a Science Volunteer Program with a population of 1,400 volunteers from eight universities in Taiwan. Students with more than 6 months of experience were selected from the population and simple random sampling was used to recruit our final participants. The science service learning length was accumulated based on their available time, such as summer/winter vacation and weekends. The digital platform was a designated website that provided science-related articles, videos, news, a discussion board, and other related sites. The role of the platform was to assist in the planning and handling of volunteer team recruitment, training, management and application. We used various scientific volunteer service activities in an innovative, diverse, popular and interesting way. Figure 2 shows the snapshot of the platform.

Our sample randomly consisted of 282 university students (86 males, 196 females) from different majors (ex. Education, Child Care and Education, Applied Foreign Languages, Accounting Information, Business Administration, Law, Fine Arts, Architecture, and Engineering) in the year 2019. Their average age was 21 years old. Regarding their average experience of service learning, 41.90% of them had volunteered for less than one year, 35.80% of them had one to two years of experience, and 22.30% of them had over three years of experience. Each participant received the questionnaires, a cover letter explaining the purpose of the study, and a consent form to join the research.

Figure 2. The snapshot of the platform

4.2 Procedure

To ensure the validity of the five questionnaires (self-efficacy, science trust, perceived usefulness, perceived ease of use) on the behavioural intention for science service learning within digital platforms, a set of questionnaires, each with a 5-point scale was sent to the sample population. The questionnaires were administered by the science mentors in each university. They monitored the participants throughout the 15-minute online survey and answered possible questions. Following are the resource descriptions of the questionnaires.

4.2.1 Self-efficacy:

This scale was from the research by Deemer et al. (2017) on science efficacy. We used the scale to measure university students' confidence level. Sample questions include, "I can manage my schedule to participate in science service learning" and "I can overcome difficulties that may happen in science service learning activities".

4.2.2 Science trust:

The questionnaire of ST was based on the measure developed by Kao et al. (2020). It measured students' belief in scientific credibility. Sample questions include, "I think scientific data is objective and reliable" and "I believe things that are science-based rather than rumour-based".

4.2.3 Perceived usefulness:

A seven-item questionnaire was used to measure PU, and was adopted from Song and Kong (2017) study. The students expressed their agreement with the usefulness of science service learning on the digital platform. Sample questions include, "As a science service learning participant, learning with digital platforms improves my competitiveness" and "As a science service learning participant, learning with digital platforms increases my ability of knowledge integration".

4.2.4 Perceived ease of use:

PEU was measured based on Song and Kong (2017) study. It refers to the ease of using the digital platform to complete science service learning. It included a seven-item questionnaire. Sample questions include, "The digital platform is easy to use when I learn online" and "I can find information easily on the digital platform when I learn online".

4.2.5 Behavioural intention of continuing science service learning with digital platforms:

The questionnaire was adopted from Drehlich et al. (2020) research. A four-item survey was applied. Sample questions include, "I will continue to join science service learning which offers materials on digital platforms" and "Through the information on digital platforms, I will participate in science service learning related activities in the future".

4.3 Data Analysis

The data were first summarized to provide descriptive statistics of the participants' responses. To test the model's validity and reliability, we analysed the data of SE, ST, PU, PEU and BI using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The items with factor loadings of less than 0.5 were excluded from the initial pool. Next, we identified the relationships among the variables. By using the structural equation modelling (SEM) procedure, we tested the dataset to fit our proposed models (Hu & Bentler, 1999); the analyses were carried out with the software AMOS using the full information maximum likelihood (FIML) approach to estimate parameters while dealing with missing data.

5. Results

In this study, the EFA and CFA methods were employed to clarify the students' variables of the Technology Acceptance Model. In order to test the effects, a SEM analysis was performed to examine the structural relationships between the variables. SE, ST, PU and PEU were deemed as predictors, while BI was viewed as the outcome variable.

5.1 Factor analysis

To clarify the structure of the students' variables of components of the extended TAM model, we used EFA and CFA to explore the item factor structure. Items were only retained within a factor if their loading exceeded 0.50 on the relevant factor and was less than 0.50 on all other non-relevant factors. As shown in Table 1, Cronbach's

alpha coefficients indicated good internal reliability for the four scales, while the results derived from the EFA method revealed the total variance. Also, the CFA showed that the results had a satisfactory fit and indicated that the survey items had good construct validity. Thus, it was considered that the scales were sufficiently reliable for measuring the students' SE, ST, PU, PEU and BI as related to science service learning within digital platforms.

As a result of the factor analysis, the final version of the SE scale consisted of nine items, and the alpha value was 0.95. The final version of the ST scale consisted of six items, and the alpha value was 0.93. It implies that these scales are reliable for measuring students' SE and ST in science service learning. In order to validate the extended TAM questionnaires, EFAs with varimax rotation were carried out so as to clarify the structure of the questionnaires. A total of seven items were included in the final version of PU, and the alpha value was 0.97. The final version of the PEU scale consisted of seven items, and the alpha value was 0.96. The BI to continue science service learning within digital platforms scale consisted of four items, and the alpha value was .86. Therefore, these scales were reliable for evaluating students' SE, ST, PU, PEU and BI to continue science service learning within digital platforms.

Table 1. EFA and CFA of the proposed variables

Scale	Item	EFA			CFA		
		factor loading	variance explained	Cronbach α	factor loading	*t*-value	Composite reliability
Self-efficacy	SE1	0.85	72.39	0.95	0.82	--	0.95
	SE2	0.81			0.77	15.25***	
	SE3	0.84			0.81	16.07***	
	SE4	0.86			0.84	17.05***	
	SE5	0.88			0.87	17.96***	
	SE6	0.88			0.87	17.57***	
	SE7	0.84			0.83	16.26***	
	SE8	0.85			0.83	16.43***	
	SE9	0.85			0.84	16.59***	
Science trust	ST1	0.86	73.13	0.93	0.83	--	0.93
	ST2	0.82			0.78	15.36***	
	ST3	0.89			0.87	17.63***	
	ST4	0.90			0.89	18.46***	
	ST5	0.84			0.81	15.89***	
	ST6	0.82			0.77	14.96***	
Perceived usefulness	PU1	0.90	83.56	0.97	0.84	--	0.97
	PU2	0.87			0.83	18.97***	
	PU3	0.93			0.92	23.28***	
	PU4	0.93			0.93	23.53***	
	PU5	0.93			0.93	23.75***	
	PU6	0.92			0.91	22.68***	
	PU7	0.92			0.90	22.07***	
Perceived ease of use	PEU1	0.80	82.0	0.96	0.75	--	0.96
	PEU2	0.88			0.85	15.27***	
	PEU3	0.93			0.93	16.96***	
	PEU4	0.92			0.91	16.61***	
	PEU5	0.94			0.93	17.06***	
	PEU6	0.92			0.91	16.51***	

	PEU7	0.94			0.94	17.10***	
Behavioural intention to continue science service learning	BI1	0.90	71.76	.86	0.90	--	0.87
	BI2	0.88			0.86	18.17***	
	BI3	0.74			0.62	11.52***	
	BI4	0.85			0.77	15.30***	

***$p < 0.001$.**$p < 0.01$.*$p < 0.05$.

5.2 The correlation between self-efficacy, science trust, perceived usefulness, perceived ease of use and behavioural intention to continue science service learning scales

Before reporting on the results of the path models to answer our research questions, an overview of correlations, means, and standard deviations of the scales of the study is provided in Table 3. The effects between self-efficacy, science trust, perceived usefulness, perceived ease of use, and their behavioural intention to continue science service learning revealed that there were significant positive correlations among all of the variables ($r = 0.49$, $p < 0.001$). On the whole, these results supported the hypothesis that the participants who had stronger beliefs in science service learning within digital platforms revealed higher behavioural intentions to continue service learning. Moreover, participants' responses to continued behavioural intention showed fairly high correlations with self-efficacy ($r = 0.63$, $p < 0.001$), science trust ($r = 0.49$, $p < 0.001$), perceived usefulness ($r = 0.56$, $p < 0.001$), and perceived ease of use ($r = 0.61$, $p < 0.001$). No confidence interval of the correlations contained the value of 1.0 (Anderson & Gerbing, 1988). Furthermore, in the structural model (estimated later), no confidence interval of the structural correlation between constructs included the value of 1.0 (Jöreskog & Sörbom, 1993). Therefore, the discriminant validity was considered acceptable.

Table 3. Descriptive statistics and correlations among the variables

Scale	Mean	SD	SE	ST	PU	PEU	BI
SE	4.21	0.58	1				
ST	4.10	0.62	0.52***	1			
PU	4.28	0.62	0.54***	0.71***	1		
PEU	4.20	0.61	0.64***	0.72***	0.90***	1	
BI	4.16	0.61	0.63***	0.50***	0.56***	0.61***	1

***$p < 0.001$.**$p < 0.01$.*$p < 0.05$.

5.3 Structural equation model analysis

Path analysis

Our analysis is informed by Sobel (1982), who performed a path analysis in order to investigate whether the mediator variable significantly carried the influence of the independent variable to the dependent variable. As a result, a recursive path analysis model was developed in light of previous research results (Baby & Kannammal, 2020; Shyr et al., 2017) that disclosed the relationships among factors influencing users' intentions in the TAM model. Some of the variables in the path analysis appeared to have direct, indirect, and total effects, as shown in Figure 3 for the following parameters:

Perceived usefulness as mediator

- SE → PU → BI showed a significant mediator effect (ß = 0.43, p < 0.001***) indicating partial mediation (due to the significant path between SE and BI).
- ST → PU → BI showed a nonsignificant mediator effect (ß = 0.14, n.s) indicating marginal mediation (due to the non-significant path between ST and BI).

Perceived ease of use as mediator

- SE → PEU → BI showed a significant mediator effect (ß = 0.46, p < 0.001***) indicating partial mediation (due to the significant path between SE and BI).
- ST → PEU → BI showed a significant mediator effect (ß = 0.16, p < 0.05*) indicating partial mediation (due to the significant path between ST and BI).

According to the SEM analysis results, the indexes of overall fit indicate that the model has a reasonable fit to the data (CMIN/DF = 2.65, RMSEA = 0.09, GFI = 0.89, AGFI = 0.91, CFI = 0.90). The measurement of the approximate adjustment of the model is found from the standardized root mean square residual (SRMR) (Hu & Bentler, 1999), which measures the difference between the observed correlation matrix and the correlation matrix implied by the model. The SRMR, therefore, shows the average magnitude of the differences. This means that a lower SRMR shows a better fit. In our case, SRMR = 0.04, which follows the recommendation that a model has a good fit when SRMR < 0.08 (Hu & Bentler, 1998).

Taken together, the path tests support the direct, indirect and total effects shown in the path analysis. The direct effects showed that SE accounted for 0.40 of BI, while ST accounted for 0.04 of BI variances. Generally speaking, these results support the argument that students who express higher SE will display more positive BI. Furthermore, the indirect mediation test results in Table 3 and Figure 3 suggest that SE predicted greater BI (ß = 0.43) through PU. SE also indirectly predicted BI (β = 0.46) through PEU. Moreover, BI was positively mediated by PEU (ß = 0.16) from ST. In other words, the results found that PEU was the mediator related to their ST in prospective BI. Thus, BI to continue science service learning would be considered as SE and ST which are strongly mediated via PEU to produce higher BI.

Table 3. Structural equation model analysis

Path	**Direct effects**	**Indirect effects**	**Total effects**
	Path coefficients		
SE → PU	0.18***		0.18***
ST → PU	0.62***		0.62***
PU → BI	0.16*		0.16*
SE →PU→ BI	0.40***	0.03	0.43***
ST→PU→ BI	0.04	0.10	0.14
SE → PEU	0.32***		0.32***
ST → PEU	0.56***		0.56***
PEU → BI	0.20*		0.20*
SE→PEU → BI	0.40***	0.06	0.46***
ST→PEU→ BI	0.04	0.11	0.16*

****p < 0.001.**p < 0.01.*p < 0.05.*

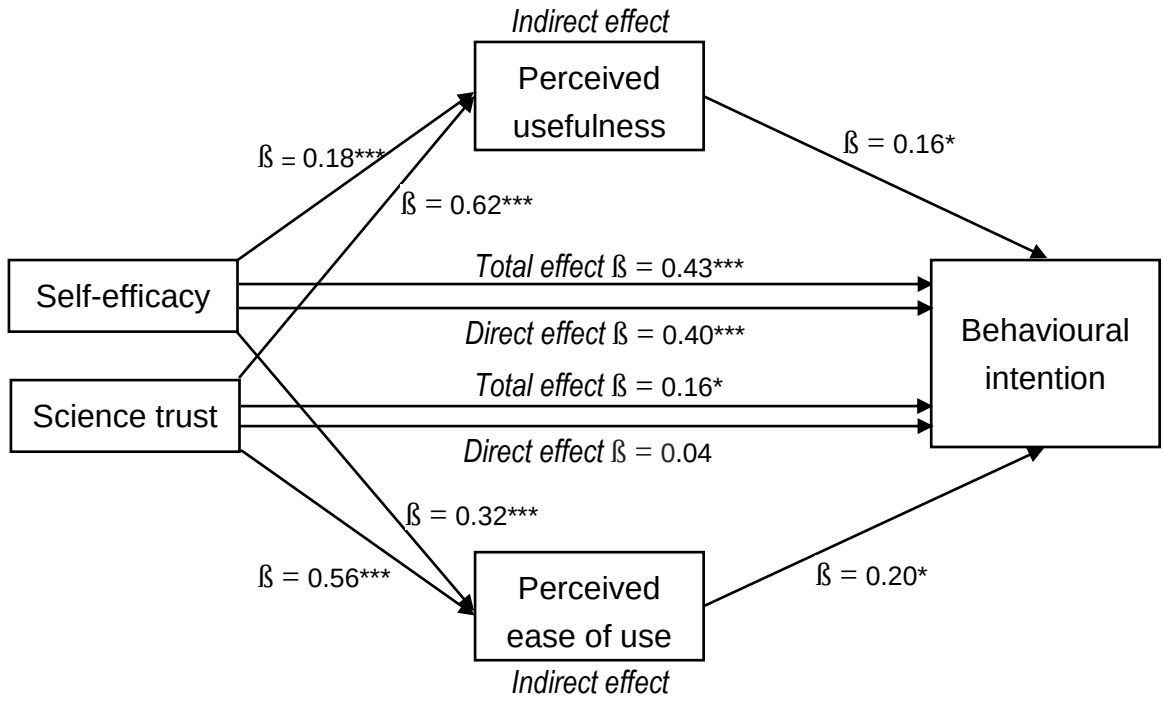

Figure 3. Path analysis of the research model

6. Discussion

6.1 Direct effects of self-efficacy and science trust on behavioural intention

In this study, SE and ST were introduced as the antecedents in the extended TAM model. SE positively contributed to the students' BI to use digital platforms in the context of science service learning. This finding corresponds to the study by Kao et al. (2020) who pointed out that science volunteers with higher self-efficacy displayed more positive intentions to continue science service learning. It also accords with the work of Bailey et al. (2017) and Ucar and Sungur (2017), who also found that higher self-efficacy in science would encourage students to involve themselves in future science-based activities.

Research, including that of Al-Emran et al. (2018), suggests that people's behavioural intention to use m-learning is affected by their self-efficacy. Other research argues that students' technology self-efficacy has a positive relationship with students' technology knowledge and experience (Nami & Vaezi, 2018). In our study, we similarly show that students' self-efficacy directly affects their intention to participate in science service learning. Students with higher self-efficacy would have more confidence in themselves and be willing to do new things.

With regard to science trust, our study also confirmed its role as a predictor of BI. The path coefficient from ST to BI was highly significant. This finding also echoes the study of Kao et al. (2020) which indicated that volunteers' trust in science positively predicted their participation in social service learning. Hence, students who had trust in science would increase their willingness to engage in science service learning within digital platforms. Therefore, we can infer that a positive belief in science has a constructive influence on students' behavioural intention to continue science service learning.

Our research shows that university students from different majors who had positive self-efficacy and trust in science would have a higher intention to continue science service learning within digital platforms. For students from science and non-science backgrounds, their confidence and science trust were important factors that would predict their behavioural intention in continuing science service learning.

6.2 Direct effects of perceived usefulness and perceived ease of use on behavioural intention

The path analysis of the SEM revealed that both PU and PEU as internal variables were strong predictors of BI. That is to say, the students who thought the digital platform was useful and easy to use would have a higher intention to continue using it in science service learning. These findings correspond with previous research (Abdullah & Ward, 2016; Walker et al., 2020). These studies found that students who regarded technology applications as useful and easy to use would gain higher interest in technology; therefore, the students would benefit from technology-enhanced learning. The path analysis results from our extended TAM model were reasonable and met our expectations since the usefulness and ease of use of the digital platforms were the fundamentals of this technology usage. The students' perceptions of the online service learning platforms would directly be reflected in their future intention to use them. Hence, based on previous research and our findings, in order to promote science service learning within digital platforms, we consider the content and design of the platforms as critical elements in attracting students' interest in using them.

6.3 Different mediation effects of perceived ease of use and perceived usefulness on behavioural intention

Analysing the mediating role of PEU, the results showed that students' BI was positively enhanced through PEU linking from both the external variables of SE and ST. SE had a significant effect on PEU as well. These positive correlations imply that students with higher SE and ST would have higher BI for science service learning when the platform is easy to use. Hence, the PEU of the digital platform is important for participants to continue joining related activities. Some corresponding findings were also indicated in previous research (Mohamed & Karim, 2012; Shen & Chuang, 2010) which suggested that perceived ease of use of the e-learning tools was positively related to students' intention to use them. Moreover, Wang and Xing (2019) pointed out that SE influenced students' usage of digital textbooks through PU and PEU. Therefore, to increase students' intention to participate in science service learning, we argue that it is necessary to provide an easy-to-use platform and help build up their self-confidence and trust in science.

Regarding the mediator role of PU, our results revealed that it was influential from SE to BI. However, it was not an effective mediator between ST and BI. Although both SE and ST had a significant influence on PU, the mediator role of PU was only effective in the path of SE. This finding was notable since in most studies PU was effective in the TAM model (Agag & El-Masry, 2016; Venkatesh et al., 2016). In the path of SE mediated through PU to BI, the positive influence is understandable. Since students with higher self-confidence could judge whether the information provided in the digital platform was useful to them, they would show a willingness to continue using and joining science service learning. However, in the path of ST mediated through PU to BI, the situations may not be the same. As we know from the literature, trust is the perception of someone's belief in the reliability of something or someone (Hoff & Bashir, 2015). From university students' perspectives, they may not believe in the information provided on the platform. There are plenty of resources on the Internet, but many are unreliable. Thus,

they could have had questions about the information and further investigated related resources to clarify or extend their knowledge in science learning (Haider & Sundin, 2020; Marshall, 2013). The other probable reason could be the usefulness of the information that may not be practical or of help (Ciobanu, 2013). This may imply that our sample of university students doubted the information and searched further for related resources to extend their practical knowledge in science learning. Hence, as a mediator between ST and BI in the extended TAM path, PU could not effectively enhance students' willingness to continue science service learning within digital platforms.

7. Conclusions and Recommendations

This study proposed an extended TAM model and aimed to determine the relationships and effectiveness of the variables self-efficacy, science trust, perceived usefulness, perceived ease of use, and behavioural intention. The results showed that SE as an external variable had strong direct effects on the BI to continue science service learning within digital platforms. That is, university students who expressed higher SE revealed greater positive behavioural intention. Moreover, the path analysis showed that PU and PEU as internal variables had strong direct effects on BI as well. However, as a mediating variable, only PEU effectively mediated both SE and ST on students' BI. Although PU had a significant mediating effect between SE and BI, it revealed no mediating effect between ST and BI. That is, university students with science trust did not highly express behavioural intention through the mediating effects of PU. In other words, students' self-efficacy and science trust were both strongly mediated through the perceived ease of use of digital platforms for them to continue science service learning.

The findings of this study on university students' behavioural intention could provide some suggestions for the development of digital platforms as well as the training in science service programmes. First, the design of the digital platform is important to draw students' intention to science service learning. In this study, although the platform is easy to use, as we know the non-effective mediator role of PU, more useful science service learning resources might be provided in order to increase their BI. For example, the science content could be more life-oriented with examples that demonstrate clear and simple scientific principles. Short videos with situational storytelling methods could gain students' attention and eagerness to use and learn them online. Also, multimedia such as animation, online interactive games, and digital comics are also favoured forms of learning that might be utilised (Adetunji & Levine, 2016; Berney & Bétrancourt, 2016; Dalal, 2014). Including multimedia content in the science service learning programme is also executable in the platform design. Thus, students could acquire more interesting and useful science information concerning the utility of science service learning activities to enhance their participation willingness in the future. It may be useful to interrogate this issue more deeply and investigate students' thinking about useful science service learning content in order to provide appropriate materials online and raise students' interest in using them. Based on the responses collected from the students and the redesign of online content, a future study could further re-examine the mediating effect of PU.

Second, the design and content of the platform should be presented in an easy-to-use and useful format such as short videos and articles that deliver key points. Since the students were from different majors, a platform that provides accessible science information is helpful for them to establish confidence and ability. Hence, improvements in both the usability and diversity of the information could provide students with more meaningful science service learning experiences.

Third, it is suggested that the integration of the digital platform into actual science service training be taken into consideration. In this study, before the students started the science service learning, they had to undertake training. Hence, the mentors' adoption of the digital platform is important for the students to take advantage of the digital resources; in this way, the students could get more engaged in the science service learning because of the integration of digital resources in the training period and may regard the platform as useful, which would further enhance their behavioural intention to use it.

Fourth, the accessibility of the digital platform is also an important feature to be considered. The widespread presence of mobile devices has made learning ubiquitous and available at any time. Positive user experiences are important for increasing students' BI in science service learning. Hence, in the development phase of the platform, compatibility with different mobile devices should be taken into consideration. Thus, students could access the digital platform that provides easy-to-understand, ready, and useful information.

Fifth, since students' SE had direct effects on their BI, it is important to provide necessary training in technology use and to offer science-related courses/workshops to establish students' SE. With appropriate training, it could not only develop students' knowledge and skills but also could probably recruit more science service learning volunteers.

Lastly, besides collecting data from surveys, it is also suggested that some qualitative work about students' platform usage data be collected to gather a deeper understanding. These data would provide valuable information on the online interaction and responses in the platform which are important for the design of the content. By providing an easy-to-use and useful digital platform, we believe the recruitment and retention of participants in science service learning will require less effort.

8. Limitations

In this study, although our extended TAM model confirmed most of the direct and indirect path coefficients, some limitations may still have to be considered. First, the sample population was recruited based on their availability, which may have caused sampling bias. Future studies could recruit participants on a random basis or with a more diverse population. Second, whether students with different duration of science service learning experiences would reflect different behavioural intentions needs further investigation. Lastly, other external variables may also be taken into consideration, such as students' motivations and technology anxiety about science service learning within digital platforms. With more comprehensive research on the TAM model in the context of science service learning, we believe that service learning in higher education can help students develop not only skills but also their knowledge and intention to further pursue STEM-related careers or studies.

Ethical statement

The work described has not been previously published. This manuscript was approved by all authors.

Consent statement

Informed consent was obtained from all individual participants included in the study.

Declaration of Interest statement

The Author declares that there is no conflict of interest.

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The Author declares that there is no conflict of interest.

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Appendix

A 5-point Likert scale (1: *fully disagree* and 5: *fully agree*) was used in the following questionnaires.

(A) Questionnaire of Self-efficacy

1. I can manage my schedule to participate in science service learning.
2. I can overcome difficulties that may happen in science service learning activities.
3. I know how to apply scientific knowledge in science service learning.
4. I can illustrate and apply scientific knowledge in science service learning.
5. I can deal with the workload efficiently in science service learning.
6. I am qualified to participate in science service learning.
7. I can conduct scientific games or experiments in science service learning.
8. My physical condition allows me to join science service learning.
9. I can design learning props for science service learning.

(B) Questionnaire of science trust

1. I think scientific data is objective and reliable.
2. I believe things that are science-based rather than rumour-based.
3. I believe that scientific results are reliable.
4. I think findings in science studies are trustworthy.
5. I believe that findings in science studies help improve the public's lives.
6. I have faith in scientific credibility.

(C) Questionnaire of perceived usefulness

1. As a science service learning participant, learning with digital platforms improves my competitiveness.
2. As a science service learning participant, learning with digital platforms increases my ability of knowledge integration.
3. As a science service learning participant, learning with digital platforms increases my learning outcomes.
4. As a science service learning participant, learning with digital platforms increases my learning efficiency.
5. As a science service learning participant, learning with digital platforms is beneficial to my scientific expertise.
6. I can learn useful scientific knowledge on the digital platform.
7. I can learn interesting scientific knowledge on the digital platform.

(D) Questionnaire of perceived ease of use

1. The digital platform is easy to use when I learn online.
2. I can find information easily on the digital platform when I learn online.
3. It is easy for me to complete science service learning online.
4. It is convenient for me to complete science service learning online.
5. The experiences of using online science service learning are like my daily online experiences.
6. I can learn about science easily on the digital platform.
7. The science contents in the digital platform are clear for me to learn things easily.

(E) Questionnaire of behavioural intention of continuing science service learning with digital platforms

1. I will continue to join science service learning which offers materials on digital platforms.
2. Through the information on digital platforms, I will participate in science service learning-related activities in the future.
3. Compared with other activities, I am more willing to attend science service learning with digital platforms.
4. I will encourage others to join science service learning activities with digital platforms.