# Determinants of Attitude towards Laptop Use among Science Teachers in Malaysia

Priscilla Moses⁺, Su Luan Wong, Kamariah Abu Bakar and Rosnaini Mahmud

Faculty of Educational Studies, Universiti Putra Malaysia, 43400 UPM, Selangor, Malaysia

**Abstract.** Malaysia's Vision 2020 calls for constant productivity-driven growth of the technological literate nation to participate fully in the global economy of the 21st century. Therefore, teachers are expected to have the capability to use Information and Communication Technology (ICT) tools and utilise the applications in the teaching and learning process. As attitude plays an important key role in determining the usage of a technology system, there is an urgent need to understand the determinants of attitude towards laptop use among the teachers. Perceived ease of use and perceived usefulness were hypothesized to be the determinants of attitude towards laptop use in this study. This survey study was conducted in the Central Region of Malaysia which involved 292 secondary school Science teachers. The statistic employed was Structural Equation Modeling (SEM) using AMOS. It was found that perceived usefulness acted as a significant determinant of attitude towards laptop use. On the other hand, perceived ease of use did not directly influence attitude towards laptop use but through perceived usefulness. Future research can be conducted on other potential variables to predict the teachers' attitude towards laptop use in the teaching and learning process.

**Keywords:** Attitude towards laptop use, perceived usefulness, perceived ease of use, Technology Acceptance Model (TAM), Structural Equation Modeling (SEM)

## 1. Introduction

Vision 2020 is the government's gigantic and comprehensive plan to turn Malaysia into an urbanised country. It calls for constant productivity-driven growth of the technological literate nation to participate fully in the global economy of the 21st century. In the direction of achieving the visualisation, Malaysia intends to transform its educational system simultaneously with Educational Development Master Plan and Malaysia's National Philosophy of Education to develop holistically the potential within the individuals. Transforming the instructional system will require changes to primary and secondary schools, moving from memory-based learning design to an education that caters to learners' abilities and learning styles; provide more equal access; and stimulates thinking and creativity [1]. In an effective Information and Communication Technology (ICT) learning environment, learners can be more active and responsible students [2, 3]. At the same time, educators need to reassess their role in the teaching and learning process as their task began to resemble a facilitator who helps the students in developing a new ICT learning environment. The teacher's role alters from the traditional task of just lecturing to facilitating the students [1, 4].

In this era, teachers are expected to progressively familiarise themselves from being a knowledgeable presenter to a knowledgeable facilitator in an ICT based classroom environment [5]. Simultaneously, educators are expected to have the capability to use ICT tools and utilise the applications in the teaching and learning process. Hence, educators need to be equipped with ICT skills in all aspects of the teaching and learning process. It requires the teachers to implement greater responsibility to be knowledgeable in ICT

---

⁺ Corresponding author. Tel.: + (6012-4840640); fax: +(603-89468246).
 *E-mail address*: prismo6@yahoo.com

tools, while seeking more active participation amongst students. In line with this, ICT tools such as laptops were provided to Science teachers in Malaysia to incorporate ICT into their teaching practices.

With the recent impetus of laptop use into Science curricula, Freiman, Beauchamp, Blain, Lirette-Pitre, and Fournier [6] stated that laptop provides prospects for more open-ended, constructive, mutual, reflective, and cognitive learning activities. Laptop creates the ability to investigate scientifically complex problems [6]. Furthermore, an investigation on laptop initiative on teachers' work over a period of four years was done by Cowie et al. [7]. Based on the findings, it was reported that the teachers teaching different subjects utilised the laptops in different manners for teaching and learning practices. Science teachers were extremely enthusiastic about the usage of laptops and the greater potential of access to laptop-plus-data projector/Internet for instruction. Generally, Science teachers felt that they were capable in assisting learning more effectively via the varied and up-to-date lesson materials that put text, interactive, simulations and real world data such as pictures (static/lively) and video clips together in their lessons. Teachers teaching Science subject reported a higher routine use of laptops for their lessons. Thus, the greater access and utilisation of visual materials supported the discussion and growth of ideas in learning Science [7].

## 1.1. Attitude towards Laptop Use

Recent studies have shown that teachers' attitude towards technology is one of the factors that determine the successful use of ICT among teachers. According to Teo, Lee, and Chai [8], the success of any initiatives to integrate technology in an educational system depends strongly upon the support and attitudes of the educators' involved. Moreover, many researchers have found attitude towards computer use to have a direct effect on the teacher's intention to use technology [9, 10]. Besides, a review of previous studies by Moses, Khambari, and Luan [11] found that one of the key factors affecting laptop use was attitude towards technology. Hence, attitude towards ICT could be known as one of the crucial human factors that affect the ICT utilization. As attitude plays an important key role in determining the usage of a technology system, there is an urgent need to understand the antecedents of attitude towards laptop use among the teachers.

## 1.2. Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Davis, Bagozzi, Warshaw in 1989 [12]. According to Davis et al. [12], user acceptance is the key factor to determine the achievement or failure of an information system. The TAM is well acknowledged to predict the technology use through behavioural intention, attitude, perceived usefulness, perceived ease of use, and external variables. The central theory of the TAM on the individual technology acceptance is determined by two antecedents explicitly namely perceived usefulness; and perceived ease of use. Based on the TAM, perceived ease of use and perceived usefulness are the two variables that determine the attitude toward using the system. The use of technology is high if the users believe that the system improves their job performance and also if they believe that the system is easy to be used [12]. Thus, it describes that perceived usefulness and perceived ease of use as the major relevance in influencing the user's attitude. Therefore, the TAM supports strongly this study which investigates the determinants of teachers' attitude towards laptop use.

Based on the aforesaid studies, perceived ease of use (PEU) and perceived usefulness (PU) were hypothesized to be the determinants of attitude towards laptop use (ALU) in this study. Therefore, the three fundamental hypotheses that will be tested are:

H1:        PU will be significantly influenced by PEU

H2:        ALU will be significantly influenced by PEU

H3:        ALU will be significantly influenced by PU

## 2. Methodology

A quantitative descriptive research design was used in this study. This study was conducted in the Central Region of Malaysia which comprises the states of Selangor, Negeri Sembilan, Federal Territory of Kuala Lumpur, and Federal Territory of Putrajaya. The respondents were 292 secondary school Science teachers. There were 37 male (12.7%) and 255 female (87.3%) teachers. The teachers' age varied from 22 to 56 years old and the reported mean value was 34.41 (S.D. = 8.455). The teachers' had less than a year to 30 years of working experience.

According to Ary, Jacobs, Razavieh, and Sorensen [13], survey research uses instrument such as questionnaires to collect data and information from the subjects. The instrument used in this research survey was a set of questionnaire. Three constructs were measured in this study namely perceived ease of use, perceived usefulness and attitude towards laptop use. The items in these constructs were adapted from Davis [14] (PEU & PU) and Albirini [15] (ALU). Additionally one item (PU5) was developed by the researchers for the rational and relevant purpose of this study.

The validity of the questionnaire was verified by four experts; each from Universiti Putra Malaysia, Universiti Sains Malaysia, Universiti Multimedia and Universiti Teknologi Malaysia. The reliability testing yielded an acceptable and high Cronbach's alpha value for PEU (0.894), PU (.906) and ALU (.882). Each of the items was measured on a scale of one to five with one indicating strongly disagree and five indicating strongly agree and vice versa for negatively worded items. Table 1 depicts the constructs and the corresponding items.

Table 1: The Constructs and Corresponding Items

| Construct | | Item |
|---|---|---|
| Perceived Ease of Use | PEU1 | Learning to operate the laptop is easy for me. |
| | PEU2 | I find it easy to get the laptop to do what I want to do. |
| | PEU3 | The laptop is flexible to interact with. |
| | PEU4 | I find it easy to become skilful in using the laptop. |
| Perceived Usefulness | PU1 | Using the laptop enables me to complete my teaching task more quickly. |
| | PU2 | Using the laptop improves my teaching performance. |
| | PU3 | Using the laptop gives me greater control over my work. |
| | PU4 | Using the laptop improves the quality of my work. |
| | PU5 | Using the laptop allows me to bring the technology into every classroom. |
| Attitude towards Laptop Use | ALU1 | I dislike using the laptop in teaching. |
| | ALU2 | I do not think I would need the laptop in my classroom. |
| | ALU3 | The laptop brings more disadvantages than advantages in my teaching. |
| | ALU4 | I would do things manually rather than using the laptop. |
| | ALU5 | I would avoid using the laptop as much as possible. |

## 3. Results

This study focuses on the determinants of attitude towards laptop use in teaching and learning process of the Science secondary school teachers. The statistic employed to analyse the quantitative data of this research was Structural Equation Modeling (SEM) using AMOS, Version 16. Maximum likelihood estimation was used as the estimation procedure.

The factor loading of each item exceeded .70 and the variance-extracted measure of the constructs exceeded 50%. The construct reliability value also exceeded .70 suggesting adequate reliability. Hence, all these items are highly significant as required by convergent validity.

The general rule to measure the overall fit is chi-square ($\chi^2$) *fit test.* The sample size recommended by Hair, Black, Babin, Anderson, and Tatham [16] to provide valid results using SEM is 200 respondents because the well-known $\chi^2$ statistics is sensitive to sample sizes [17]. The significance of $\chi^2$ statistics was not applicable in this study as the sample size was 292. Hence, to decrease the sensitivity of the $\chi^2$ test on sample size, other approximate fit indexes such as the ratio of $\chi^2$ statistic to its degree of freedom ($\chi^2$/df), GFI, TLI, CFI and RMSEA were computed in this study to test the model fit. Table 2 depicts the recommended guidelines and fit indices for the research model. All the values satisfied the recommended guidelines of the acceptable fit. Therefore, the research model indicates a good fit ($\chi^2$/df < 3, GFI, TLI, CFI > .9, and RMSEA <.08).

The results of the research model are illustrated in Figure 1. Perceived ease of use had a significant direct effect on perceived usefulness ($\beta =$.662; p < 0.001), supporting hypothesis H1. However, hypothesis H2 was not supported in this study. Based on the results, there was no significant influence of perceived ease of use on teachers' attitude towards laptop use ($\beta = 0.096$, p > 0.05). On the other hand, attitude towards laptop use was found to be influenced by perceived usefulness ($\beta =$.662; p < 0.001), supporting hypothesis H3. Table 3 depicts a summary of the three hypotheses testing results obtained in this study.

Table 2: Results of Model Fit Indices for the Research Model

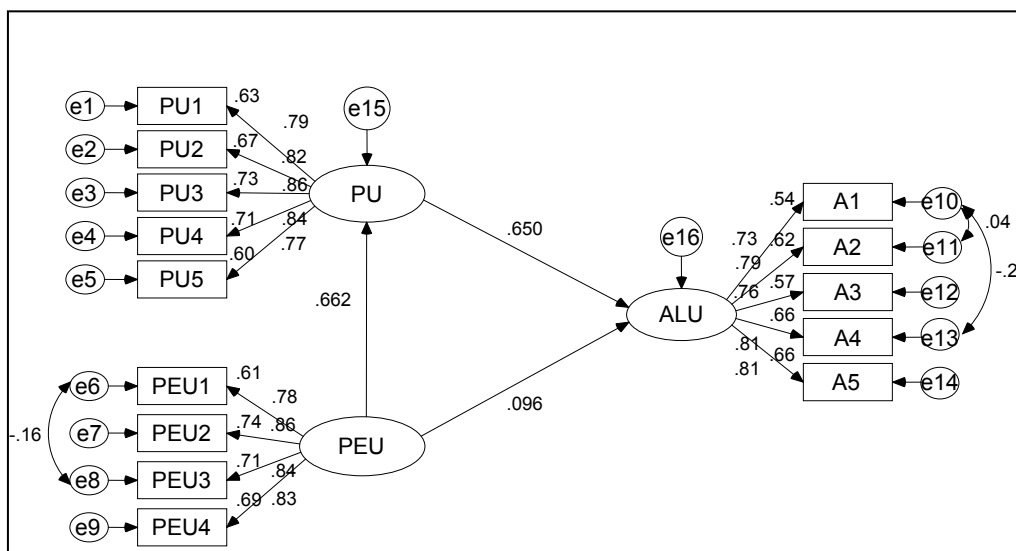| Fit Indices | Recommended Guidelines | Research Model |
|---|---|---|
| $\chi^2$ | not significant at $p < .05$ | 275.962, significant at $p < .001$ |
| $\chi^2/df$ | < 3.0 | 1.943 |
| GFI | > 0.9 | .933 |
| TLI | > 0.9 | .965 |
| CFI | > 0.9 | .973 |
| RMSEA | < 0.08 | .041 |



Figure 1: Model Testing Results for Science Teachers

Table 3: Hypothesis Testing Results

| Hypothesis | Path | Path Coefficient | Result |
|---|---|---|---|
| H1 | PEU ➔ PU | .662 * | Supported |
| H2 | PEU ➔ ALU | .096 * | Not supported |
| H3 | PU ➔ ALU | .650 | Supported |

* Significant $p < 0.001$

The two endogenous variables tested were perceived usefulness and attitude towards laptop use. For this research model, 44% of the variance in perceived usefulness was explained by perceived ease of use. Besides, it was estimated that perceived usefulness explained more than half, 52% of attitude towards laptop use variance. The predictor of perceived usefulness was perceived ease of use whereas the determinant of attitude towards laptop use was perceived usefulness. However, perceived use of use indirectly influenced attitude towards laptop use via perceived usefulness.

## 4. Discussion and Conclusion

The purpose of this study was to explore the determinants of attitude towards laptop use among the Science teachers. It was found that perceived usefulness acted as a significant determinant of attitude towards laptop use. On the other hand, perceived ease of use did not directly influence attitude towards laptop use but through perceived usefulness. This study suggested perceived usefulness as a total mediator between perceived ease of use and attitude towards laptop use.

The results from this study supported two out of the three hypotheses postulated. The findings revealed that teachers' perceived ease of use had a significant influence on their perceived usefulness of laptops. If the laptops used by the teachers are perceived as easy to use, it is expected to be perceived as more useful in the teaching and learning process. When the teachers feel laptops as a complex tool to be used, they tend to find the teaching tool as less useful for their teaching. This result is in parallel with the previous studies [12, 18].

Only one of the predicted determinants was found to be significant in predicting attitude towards laptop use — perceived usefulness. This is supported by Teo et al. [8] and Davis et al. [12] who claimed perceived usefulness to be one of the key determinants of attitude. However, the other variable (perceive ease of use)

indirectly influenced attitude towards laptop use via perceived usefulness. This contradicted with Davis et al.'s findings [12] which found perceived ease of use to have a direct effect on the attitude toward using the system.

This suggested that the Science teachers were more likely to have a positive attitude towards laptop use when they perceived laptops as useful in improving their teaching performance. Even though the simplicity of the laptops help them to incorporate the laptops into the teaching and learning process, perceived usefulness outweighs perceived ease of use in influencing the teachers' attitude to use the laptops for lesson delivery.

# 5. References

[1] Smart School Project Team. The Malaysian smart school: An MSC flagship application. A Conceptual Blueprint. Kuala Lumpur: Government of Malaysia, 1997.

[2] A. Matthíasdóttir, M. Dal, S. C. Lefever. How do teachers use information and communication technology in Icelandic high schools in 2002? International Conference on Computer Systems and Technologies – CompSysTech, 2003.

[3] H. T. K. Yee, W. S. Luan, A. F. M. Ayub, R. Mahmud. A review of the literature: Determinants of online learning among students. European Journal of Social Sciences. 2009, 8 (2): 246-252.

[4] R. Olliges, S. Mahfood. Teaching and Learning in the New Millennium: Transformative Technologies in a Transformable World. Communication Research Trends. 2003, 22 (2): 1- 43.

[5] S. L. Wong, H. Atan. Gender differences in attitudes towards information technology among malaysian student teachers: A case study at Universiti Putra Malaysia. Educational Technology & Society. 2007, 10 (2): 158-169.

[6] V. Freiman, J. Beauchamp, S. Blain, N. Lirette-Pitre, H. Fournier. Does one-to-one access to laptops improve learning: Lessons from New Brunswick's individual laptop school initiative. Procedia Social and Behavioral Sciences. 2010, 2: 5686–5692.

[7] B. Cowie, A. Jones, A. Harlow, C. McGee, B. Cooper, M. Forret, T. Miller, B. Gardiner. TELA: Laptops for Teachers Evaluation, Final Report Years 9-13. University of Waikato, 2008.

[8] T. Teo, C. B. Lee, C. S. Chai. Understanding pre-service teachers' computer attitudes: Applying and extending the technology acceptance model. Journal of Computer Assisted Learning. 2008, 24 (2): 128-143.

[9] T. Teo, C. B. Lee, C. S. Chai, S. L. Wong. Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the technology acceptance model (TAM). Computers & Education. 2009, 53: 1000–1009.

[10] W. S. Luan, T. Teo. Investigating the technology acceptance among student teachers in Malaysia: An application of the technology acceptance model (TAM). Asia-Pacific Education Researcher. 2009, 18 (2): 261-272.

[11] P. Moses, M. N. M. Khambari, W. S. Luan. Laptop use and its antecedents among educators: A review of the literature. European Journal of Social Sciences. 2008, 7 (1): 104-114.

[12] F. D. Davis, R. P. Bagozzi, P. R. Warshaw. User acceptance of computer technology: A comparison of two theoretical models. Management Science. 1989, 35 (8): 998-1003.

[13] D. Ary, L. C. Jacobs, A. Razavieh, C. Sorensen. Introduction to research in education *(7th ed.)*. Canada: Thomas Wadsworth, 2006.

[14] F. D. Davis. Perceived usefulness, perceived use and user acceptance of IT. MIS Quarterly. 1989, 13 (3): 319-339.

[15] A. Albirini. Teachers' attitudes toward information and communication technologies: the case of Syrian EFL teachers. Journal of Computer & Education. 2006, 47: 373-398.

[16] Jr. J. F. Hair, W. C. Black, B. J. Babin, R. E. Anderson, R. L. Tatham. *Multivariate data analysis (6th ed.)*. New Jersey. Prentice Hall, Pearson Education, Inc, 2006.

[17] R. Ho. Handbook of univariate and multivariate data analysis and interpretation with SPSS. Boca Raton: Chapman & Hall/CRC, Taylor & Francis Group, 2006.

[18] Y. M. Shiue. Investigating the sources of teachers' instructional technology use through the decomposed theory of planned behavior. Journal Educational Computing Research. 2007, 36 (4): 425-453.