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The Effect of Physical Learning Environment on Students' Achievement, and the Role of Students' Attitude as Mediator

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The physical learning environment plays an important role in the teaching and learning process, helping to improve students' command of the Arabic language. In Malaysia, students' command of the language is still low, so there is a need to examine the factors that influence students' command of the Arabic language, because good command of the language is an indicator of students' success. This study examined the influence of physical learning environment on students' achievement and the role of students' attitude as a mediator in the relationship between the physical learning environment and students' achievement. A quantitative research method was used. The data were collected by distributing questionnaires adapted from previous studies. A total of 494 students at eight Malaysian public universities offering undergraduate programs in the Arabic language were involved in the study. The methods of data analysis used were descriptive and inferential. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were also carried out. The data were analysed using the Statistical Package for the Social Science (SPSS-22) and the Structural Equation Modelling-Partial Least Square (Smart-PLS 3) software. Based on the results, the study found that the physical learning environment positively and significantly influenced students' achievement, and that students' attitude mediated the relationship between the physical learning environment and students' achievement.

Key words: *Physical learning environment, students' achievement, Malaysian public universities, students' attitude, mediator.*

Background to the Study

Many studies have been conducted to examine the effectiveness of teaching and learning in improving students' achievement. Several studies have found that learning environment positively affects student's achievement, particularly in learning the Arabic language (Yusoff, 1999; Sulaiman et al., 2013; Ismail, 2001). A conducive learning environment acts as a catalyst for friendship, intellectual activities, collaborations, and supportive activities that encourage students' development and learning (Ahmad & Fraser, 2012; Osman & Halim, 2010) and subsequently improves their achievement (Fraser, 2012; Hamed, Bahari & Abdullah, 2009; Noh, 2008; Nor, 2005; Bakar, 2006). A study also found that unsuitable learning environment could lead to poor learning (Ahmad, 2011).

A conducive learning environment plays an important role in improving students' command of the Arabic language. Findings have revealed a strong relationship between learning environment and students' learning outcomes, whether due to their achievement or their success (Ahmad, Osman & Halim, 2010; Fraser, 2012; Noh, 2008; Mokhtar, 2012; Ismail, 2001; Kilue & Muhamad, 2017). Previous studies have also found that students have difficulty applying the language skills in a normal environment. A suitable environment for Arabic language learning therefore needs to be created to enable students to apply their newly acquired language skills, particularly in the classroom.

Attitude also plays an important role in education. Attitude can influence how a person thinks, acts, presents and feels when facing an object, an idea, a situation or a value (Rakhmat, 2001; Yahya & Amir, 2018). A community with a positive attitude will influence its members to be positive. This has been proven by the Japanese and English races, whose success started from a positive attitude (Mukhtar, 2008). Many factors influence students' attitude, including environment. The learning environment surrounding students can shape their attitude (Crow & Crow, 1983). A study by Kamisah and Zanaton (2007) found that teachers' actions influenced students' attitude towards certain subjects. Another study of private secondary school students' attitudes towards the Malay subject by Nor Azizah Abdul Aziz, Siti Hajar Idrus and Zamri Mahamod found that the percentage of respondents who agreed that teachers influenced their attitude towards the subject was very high (85.6%) Thus, learning environment can positively impact students' attitude and their interest in certain subjects.

Other studies also found strong relationships between learning environment and students' attitudes. Studies by Quek, Wong and Fraser (2005) and Okan (2008) found that there was a relationship between learning environment at schools and attitude. A study by Allen and Fraser (2007) also found that a relationship between learning environment and students' outcomes (attitude towards science and achievement in science). Likewise, studies by Che

Nidzam Che Ahmad (2011) and Tessmer and Harris (1992) found that a conducive physical environment consisting of three elements – good internal air quality, comfort and good air circulation – could positively and significantly affect students' attitudes and level of achievement.

The purpose of this study is to examine the influence of physical learning environment on the achievement of students at Malaysian public universities and the role of students' attitudes as a mediator in the relationship between the physical learning environment and their level of achievement.

Methodology

The study used a quantitative research method. The data were collected by distributing questionnaires, which were used as the main research instrument (Chua, 2006; Fowler, 2002). Participants comprised 1,883 students at eight universities offering undergraduate programs in the Arabic language, namely Universiti Malaya, Universiti Kebangsaan Malaysia, Universiti Islam Antarabangsa Malaysia, Universiti Perguruan Sultan Idris, Universiti Putra Malaysia, Universiti Sains Islam Malaysia, Universiti Teknologi Mara and Universiti Sultan Zainal Abidin. A total of 494 students were then selected using cluster random sampling and the technique of sample size determination proposed by Kreijcie and Morgan (1970), which gave a minimum sample size of 320 students for a population size of 1,883 (N = 1,883). Next, the data was analysed using the SPSS-22 and SmartPLS-3 software to determine the mediating variable's direct influence and role in the relationship between the independent variable and dependent variable.

Findings

Before the data were analysed, they were first subjected to a data-filtering process. Data filtering was carried out to ensure that the data used were both reliable and valid. The process involved analysing missing data values and outliers. In addition, multivariate tests were conducted, such as a linearity test, normality test, homoscedasticity test and multicollinearity test. To achieve the objective of the study, structural equation modelling was used to test the hypothesis stated. There are two measurement models of structured equation: reflective and formative. The study used the reflective measurement model. The assessment of the model included the test of internal reliability consistency.

Internal consistency reliability was tested using Cronbach's alpha coefficient value, which is a traditional method of testing internal consistency reliability (Urbach, Smolnik & Riempp, 2010). High alpha value indicates that the items in the constructs are consistent with one another (Cronbach, 1951). In addition, the composite reliability method can be used as an

alternative to measure internal consistency reliability (Chin, 1998). Composite reliability is used to offset the shortcomings of the measurement using Cronbach's alpha (Chin, 1998). The use of both methods for testing internal consistency reliability further justifies the strength of the constructs. A research instrument is considered to have good reliability if its alpha and composite reliability values are equal to or greater than 0.70 (Nunally & Bernstein, 1994).

Table 1: Cronbach's alpha coefficient value and composite reliability

Construct	Cronbach's alpha	Composite reliability
Technology	0.925	0.939
Lighting	0.907	0.928
Students' Cooperation	0.898	0.917
Attitude	0.898	0.914
Equipment and Furniture	0.814	0.865
Air Quality	0.780	0.850

Table 1 shows the results of internal consistency reliability tests using Cronbach's alpha and composite reliability. Cronbach's alpha and composite reliability values were greater than the minimum value of 0.70, so it was concluded that all the research instruments had high reliability values. After the alpha and composite reliability tests were conducted, an indicator reliability test was also carried out.

Indicator reliability is one of the assessments used in the measurement model to test whether items in the constructs are consistent with the variables being measured (Urbach, Smolnik & Riempp, 2010). The confirmatory factor analysis (CFA) test was also carried out to ensure that the items were capable of measuring the constructs or variables. The items with a score less than 0.70 were considered unqualified to remain in the constructs (Chin, 1998). However, when the factor loading value was greater than 0.50 and smaller than 0.70, the items could remain when the construct validity value (AVE) was greater than 0.5 (Hair et al., 2014). The degree of item significance was tested using bootstrapping with a resampling of 500 times.

The results showed that all the items exceeded the 0.70 level except the Attitude item (0.598 loading value). However, the item's t statistic value of 16.943 exceeded 1.96, meaning the item was significant and could be used to measure the Attitude construct. Thus, it was concluded that the study met the indicator reliability requirement. After the indicator reliability test was conducted, the construct validity test was carried out.
Construct validity was tested to establish the congruence between the actual measurements and the theories (Sekaran & Bougie, 2010). Construct validity is commonly tested with convergent validity and discriminant validity (Hung, Chang & Hwang, 2011). Convergent validity measures the degree of convergence of items in representing the constructs to be

measured (Gefen & Straub, 2005). Fornell and Larcker (1981) and Hair et al. (2010) proposed the coefficient value of average variance extracted (AVE) of 0.50. Convergent validity is assessed on the basis of composite reliability value. If the value is greater than 0.80 (Nunally & Bernstein, 1994), the research instruments have met the convergent validity standards. In addition, a factor loading value of more than 0.7 indicates that the research instruments have met convergent validity standards (Fornell & Larcker, 1981). Table 2 shows the convergent validity results.

Table 2: Convergent validity

Construct	**AVE**
Equipment and furniture	0.520
Air quality	0.543
Lighting	0.683
Students' achievement	0.698
Attitude	0.516
Physical environments	0.604
Technology	0.660

As shown in Table 2, all the constructs exceeded the values suggested by previous researchers, thereby confirming that every construct met the construct validity standards. The subsequent test was the discriminant validity test.

Discriminant validity can be measured using several methods. One is by examining the value of square root of AVE, where the value of each construct must be higher than the correlation of other constructs (Fornell & Cha, 1994; Fornell & Larcker, 1981; Henseler et al., 2009). Based on discriminant validity (Fornell-Larcker Criterion – see Table 2), the square root value of AVE was higher than the correlation value of AVE for other constructs.

After the measurement model, the structural model was used to evaluate and test the hypotheses. The structural model contains paths that define the relationship between constructs (hypothesised relationship) and information on the value of beta (β) for the testing of hypotheses and R^2 value. The strength of the relationship is represented by β value while the contribution of all independent variables to the dependent variable is determined by the R^2 value. Chin (1998) states that the value of $R^2 = 0.67$ is strong, the value of $R^2 = 0.33$ is average, and the value of $R^2 = 0.19$ is weak.

R^2 value refers to the variance percentage in a model and represents the predictive power. Table 3 shows the β and R^2 values. Based on the results, it was concluded that the study, which examined three endogenous variables, had moderate and strong predictive power.

Table 3: R^2 values

Variable	R^2	R^2 adjusted
Students' achievement	0.671	0.669
Attitude	0.260	0.257

The value of R^2 for students' achievement obtained in the study was 67.1 percent (0.671). This means that the extent to which the independent variable explained students' achievement variable was 67.1 per cent, while the other 32.9 per cent was explained by other variables. The R^2 value for the students' achievement variable belongs in the strong category (Chin, 1998).

The value of R^2 for the attitude variable obtained in the study was 26 per cent (0.260). This means that the extent to which the independent variable explained the attitude variable was 26 per cent, while the remaining 74 per cent was explained by other variables not examined in the study. The R^2 value for the attitude variable belongs in the weak category (Chin, 1998).

The effect of a variable on another variable can also be measured using effect size (f^2 0.020 to 0.149 = small, 0.150 to 0.349 = moderate, 0.350 and greater = big (Chin, 1998; Cohen, 1988; Gefen, Straub & Boudreau, 2000). The results showed that the independent variable had a small effect on both students' attitude and students' achievement (Table 4).

Table 4: Strength of effect (f^2)

Variable	Students' achievement	Conclusion
Attitude	0.260	Small

As shown in Table 4, the strength of the effect of the attitude variable towards students' achievement was only 2.6 per cent (0.260). This value falls under the medium category (Chin, 1998; Cohen, 1988; Gefen, Straub & Boudreau, 2000).

In addition to R^2, the predictive sample reuse technique used by Stone (1974) and Geisser (1975) can be used to assess the predictive relevance of the independent variable. In SmartPLS 3.0 software (Ringle et al., 2005), the blindfolding procedure was used to obtain the predictive relevance value (Q^2) (Tenenhaus, Vinzi, Chatelin & Lauro, 2005). The predictive relevance value suggested by previous researchers is greater than 0 and smaller than 1.

As shown in Table 5, Q^2 was greater than 0 and smaller than 1. The smallest predictive relevance value was 0.116, for the Attitude variable. For the impact of predictive relevance, Attitude contributed 74.9 per cent towards the Students' achievement construct.

Table 5: Predictive relevance value – Q^2 and predictive relevance impact – q^2

Construct	SSO	SSE	Q^2	q^2
Equipment and furniture	2,964.000	2,308.713	0.221	-
Air quality	2,470.000	1,837.353	0.256	-
Lighting	2,964.000	1,569.494	0.470	-
Students' achievement	2,470.000	1,325.451	0.463	0.749
Attitude	4,940.000	4,365.163	0.116	-
Technology	3,952.000	1,871.657	0.526	-

Table 6: Direct effect test

Variable	Original sample (β)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Physical learning environment --> Students' achievement	0.166	0.033	5.086	0.000
Physical learning environment --> Attitude	0.427	0.045	9.571	0.000

Hypothesis 1 proposed that the 'Physical learning environment positively and significantly influences the achievement of students in Arabic language classes at Malaysian public universities'. The results showed that the beta coefficient (original sample) was 0.166 with a standard deviation of 0.033, the t-statistics was 5.086 and the significance level was at 1 per cent (≤ 0.01). This indicates that the physical learning environment had a positive and significant influence on the achievement of students in Arabic language classes at Malaysian public universities. An improvement of 1 per cent in physical environment would lead to an improvement of 16.6 per cent in students' achievement. Thus Hypothesis 1 (Ha) was accepted.

Hypothesis 2 proposed that the 'Physical learning environment positively and significantly influences the attitude of students in Arabic language classes at Malaysian public universities'. The results showed that the beta coefficient value (original sample) was 0.427 with a standard deviation of 0.045, the t-statistic was 9.571 and the significance level was at 1 per cent (≤ 0.01). This indicates that psychosocial component had a positive and significant influence on the attitude of students in Arabic language classes at Malaysian public universities. An improvement of 1 per cent in psychosocial environment would lead to an improvement of 42.7 per cent in students' attitude. Thus Hypothesis 2 (Ha) was accepted.

Table 7: Indirect effect (mediator) test

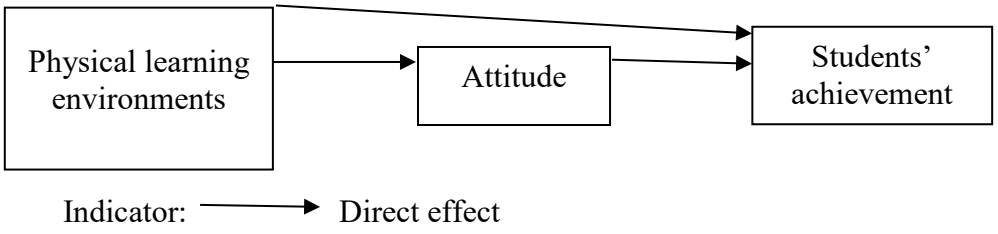
Variable	Original sample (*β*)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Physical learning environment --> Attitude --> Students' achievement	0.293	0.035	8.280	0.000

Hypothesis 3 proposed that 'Students' attitude plays the role of a mediator in the relationship between physical learning environment and the achievement of students in Arabic language classes at Malaysian public universities'. The results showed that the beta coefficient value (original sample) was 0.293 with a standard deviation of 0.035, the t-statistic was 8.280 and the significance level was at 1 per cent (≤ 0.01). This indicates that there was a mediator effect – namely students' attitude – in the relationship between physical learning environments and the achievement of students in Arabic language classes at Malaysian public universities. An improvement of 1 per cent in students' attitude would lead to an improvement of 29.3 per cent in students' achievement. Thus Hypothesis 3 (Ha) was accepted.

Discussion

The independent variable in the study was physical learning environment. Findings showed that the physical learning environment had a direct effect on the dependent variable (students' achievement). The testing of the hypothesis on the effect of mediating variable was carried out using the structured equation modelling (SEM Smart-PLS). Findings showed that the attitude variable provided a mediator effect in the relationship between the physical learning environment and the achievement of students in Arabic language classes at Malaysian public universities. The mediator effect in the relationship is illustrated in Figure 1.

Figure 1. Mediator effect (students' attitude and satisfaction) in the relationship between physical learning environment and students' achievement at Malaysian public universities



In addition to students' attitude and satisfaction, the psychosocial component has also been found to affect students' motivation and subsequently improve their achievement. The psychosocial component, or psychosocial learning environment, is very important and it

needs to be studied further, given that the psychosocial learning environment influences the classroom learning environment (Thomas, 2000).

Conclusion

Physical learning environments positively and significantly influenced students' achievement in this study. In addition, students' attitude acted as a mediator in the relationship between physical learning environments and students' achievement.

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