



## Web-based Learning Environment and Learners' Achievement: Mediating role of Learners' Enjoyment\*

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### ARTICLE INFO

#### Article History:

Received: 11 January 2021

Received in revised form: 18 July 2021

Accepted: 10 August 2021

DOI: 10.14689/ejer.2021.94.18

#### Keywords

Learners' Achievement; Learners' enjoyment; Web-Based Learning Environment; Access To Learning; Interaction; Lecturer-Support; Equity; Investigation;

### ABSTRACT

**Purpose:** Grounded in the Environmental Learning Theory, this study was conducted to examine the role of web-based learning environment factors including access to learning, interaction, lecturer-support, equity, and investigation and how it affects learners' achievement through the mediating role of learner's enjoyment among the university students.

**Methodology:** Applying a time-lagged survey methodology, data was collected from 542 university students in Bengkulu, Indonesia. Data was analyzed using Smart PLS 3.0 software.

**Results:** The results revealed a positive impact of all 5- web-based learning environment factors on learners' enjoyment and achievement. However, access to learning and interaction had the most prominent impact on learners' enjoyment. At the same time, interaction and equity had the highest direct impact on the learners' achievement. Additionally, all these associations of web-based learning environment factors with learners' achievement were mediated by learners' enjoyment  
**Implications for Research and Practice:** Further, key policy insights and multiple theoretical and managerial implications along with future research directions are suggested.

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## Introduction

Web-based learning or e-learning has gained much acclaim in the educational sector, especially during the current pandemic, when most educational institutions around the world have been forced to switch to distance and embedded learning (Himat, Takal, & Hakimi, 2021). Universities and colleges have introduced web-based learning in various courses to increase access, interaction, reduce costs, and introduce enjoyment and meaningful learning opportunities (Yang & Wu, 2021). Moreover, web-based learning includes plug-ins, self-assessment-based programs, animations, and simulations using various tools and software (Bakar, Salim, Zainuddin, Noor, & Mohamad, 2021). In this study, the focus will be on a web-based learning environment to further extend the knowledge on its impact on learner's achievement through the mediating role of learner's enjoyment.

A learner's achievement has been defined in the literature as measuring the amount of academic content a student learns in each academic period (Samosa, 2021). Every institution sets certain goals and academic standards that the students are expected to excel (Im & Kang, 2019). Achievement, therefore, is associated with frequent progress in assessments and examinations taken by instructors and institutions (Soland & Sandilos, 2021). Moreover, the web-based learning environment comprises of five factors: access to learning, interaction, lecturer-support, equity, and investigation (Bakar et al., 2021; Marini et al., 2021). Access to learning is an important factor, especially in online/e-learning, as it includes information and knowledge that needs to be made available to the students to perform well (Margaret, 2021). Besides, access to learning requires increased e-learning accessibility without geographic limitations and the ability to receive all the necessary course material updates in efficient manner (Rahayu et al., 2021a). Moreover, students should always be able to access the course material regardless of time, location, and device used to achieve more academic objectives (Cao, Cai, Yue, Cai, & Hang, 2020).

Furthermore, in a web-based learning environment, a learner interacts with content, instructor, peer, and self to derive meaning, enrich understanding, and participate in the learning activities (Hossain, 2021). Interaction is an important element in a learner's achievement because it enhances their cognitive skills (Nilakusmawati, Suprapti, Darmawan, & Raharja, 2021). Additionally, web-based learning can be complex, intricate, and challenging for learners as it requires the use of various skills and know-how of technology (Margaret, 2021). Therefore lecturer's support is important to ensure feasibility (Rahayu et al., 2021b). Hence, this unique critical factor was also explored in this study to determine its impact on learners' enjoyment and resultant achievement. Similarly, the importance of enjoyment in learning cannot be neglected, and recent studies have started to focus on its theoretical implications for better achieving learning outcomes (Luczak & Kalbag, 2018). Many researchers have associated the concept of learner's enjoyment with satisfaction or fun (Bashori, van Hout, Strik, & Cucchiarini, 2021), but uniquely in this study, we will explore its emotional value to advance the field. This concept underlies the subjective

feelings associated with various learning material, methods, and level of interactivity that is used to engage the learners (Z. Zhang, Liu, & Lee, 2021). Hence it can have a very positive effect on learning, which has not been previously investigated in terms of factors affecting learning and learners' achievement in the web-based learning environment.

Another important factor that has not been given attention in the literature previously is online learning equity. Although laws require institutes to comply with equity (Junhong, 2021), very few studies have investigated its role in learning (Junhong, 2021; Westhuizen, 2012). Besides, equity means to provide just and equal opportunities to all students regardless of their ethnic background, religion, gender, race, or color (Ray, Bala, Chakraborty, & Dasgupta, 2021). Due to various barriers of engagement involved in online learning, achieving equity becomes a challenge (Bakar et al., 2021). However, based on its immense importance in the learning mechanism, we will explore it in terms of achievement and enjoyment. Moreover, inquiry-based learning aspire students to engage in a cognitive process to achieve learning outcomes (Hanh, 2021). Besides, investigation in learning relates to inquiry phases based on engagement, exploration, explanation, elaboration, and evaluation that aid in the enriching understanding of course material (Özdemir & Ahmet, 2021). Therefore, incrementally this study will explore its role in learners' enjoyment and achievement.

Furthermore, the current study has been conducted in Indonesia because the Indonesian students are among the most active technology users, according to new research by Cambridge International in Global Census (Solikhatun & Priantinah, 2021). A study released earlier in July 2020 pointed out that Indonesian students are among the highest technology users in education (Rahayu et al., 2021b). Therefore, this study setting becomes vital to investigate that to what extent web-based learning incorporated by Indonesian universities is aiding learner's achievement.

Finally, besides its contextual significance, the theoretical framework of this study is based upon the Environmental learning Theory, which suggests that knowledge acquisition takes place through an integrated cognitive representation of learner thought process over a certain period of time (Stevenson & Stirling, 2010). An individual adds fragmentary information based on awareness and sensitivity towards environment to develop knowledge and understanding, leading towards attitudes, skills, and participation (Ballantyne, Hughes, Lee, Packer, & Sneddon, 2018). Moreover, the theory revolves around the idea that a web-based learning environment enable individuals to learn from their environment and develop critical thinking for enhanced problem-solving and decision-making skills (Robelia, Greenhow, & Burton, 2011). Hence, the current study, is grounded in the environmental learning theory of a web-based learning environment formulated through various tools, digital devices, and interactivity to answer the following significant questions:

1. To what extent does web-based learning environment, including access to learning, interaction, lecturer support, equity, and investigation, impact learners' achievement?
2. To what extent does web-based learning environment, including access to learning, interaction, lecturer support, equity, and investigation, impact learners' enjoyment?
3. To what extent does learners' enjoyment impact their achievement?
4. Does learners' enjoyment mediate the association of web-based learning environment, including access to learning, interaction, lecturer support, equity, and investigation, with learners' achievement?

A web-based learning environment offers several challenges; therefore, the current study explored how web-based learning environment factors influenced learner achievement. This unique notion has not been explored previously in the domain of education management. It is hoped that this study would reveal the direct and indirect impact of web-based learning environment model factors on the achievement among Indonesian university students through the mediating role of enjoyment.

## Literature Review

### *Web-based Learning Environment and Learners' Achievement*

(Bakar et al., 2021) observed that a web-based learning environment enables students to interact with technology, content, and virtual learning, using different skills. The study also discovered certain factors of the web-based learning environment, including access to learning, interaction, lecturer support, equity, and investigation that had not been examined previously, that made an impact on learners' achievements. Moreover, studies show that learning ability in the virtual environment is affected by accessibility (Gregg, 2012; McLinden, Douglas, Cobb, Hewett, & Ravenscroft, 2016). Hence, to achieve learning outcomes, web-based learning requires the same educational experience for everyone through the use of multiple tools like a screen reader, screen magnifiers, alternative keyboards, touchpads, etc. (Walton, Childs, & Blenkinsopp, 2005).

Moreover, research findings have revealed that interaction plays an important role in increasing student engagement (Saeed, Khaksari, Eng, & Abdul Ghani, 2016). The literature also reveals that learner-instructor interaction, including assistance, counsel, and support provided by the instructor, enhances understanding of content (Rahayu et al., 2021a). Simultaneously, the learners' interaction with the content of study material through access, organization, and interpretation enables improved performance in exams (Garzón-Díaz, 2021). Besides, the learner can gain confidence and self-esteem to participate through peer interaction, paving a way to assessment

enabled by chat groups, audio, and videos, while such an assessment to learning and interaction enhanced learners' achievement. (Reisslein, Sullivan, & Reisslein, 2007).

Recent studies have shown that students who believe that their instructor values their emotional and mental health develop a strong interpersonal relationship with them, which aid in their learning (Brooks et al., 2021). Research also points out that lecturer support is positively associated with student engagement, learning, and student participation (Dalziel, Guarda, Ackerley, & Clark, 2016). In addition, previous literature indicates that learners' achievement depends on lecturers' guidance, communication, and support (Nor, Nor, Daud, & Hisham, 2012).

In the last decade, (Westhuizen, 2012) had demonstrated that the grading system in an educational institution should be based upon equity to attain maximum students' success and parents' positive feedback. In addition, various studies have previously found a positive association between active learning and learner's achievement (Aubusson, Burke, Schuck, Kearney, & Frischknecht, 2014; Fetaji, 2008; Yamamori, 2019). While in the current time, researchers believe that providing equity in virtual learning requires fairness in access and opportunity for the content of course material, updates, and instructor feedback (Junhong, 2021). Researchers in the current time believe that students who question facts and inquire about logical units help develop a thorough understanding of course material and achieve learning outcomes (Rohana, 2020; Sadeghi, Sajjadi, Nooshabadi, & Farahani, 2018; Scanio, 2021).

The current study planned to examine the positive impact of access to learning and interaction on learners' achievement, hence it focused specifically on the positive impact of lecture support, equity, and investigation on learners' achievement. Based on the above discussion and Environmental Learning Theory, which advocates that a web-based environment enables individuals to learn from their environment and achieve more, the following hypothesis is proposed:

*H1: There is a positive impact of access to learning, interaction, lecturer support, equity, investigation on learners' achievement*

#### *Web-based Learning Environment and Learners' Enjoyment*

The learners' enjoyment is the manner in which learners feel to derive a sense of pleasure aroused from a learning environment (Lee & Lee, 2021). It is believed that access to learning considers all learners' needs, offering flexibility in time, place, mode, and pace of learning (Gregg, 2012; Sawatsuk, Darmawijaya, Ratchusanti, & Phaokrueng, 2018). Previous literature makes it evident that accessibility in learning allows students to design, interact, solve, and participate in learning, which leads to students deriving a sense of pleasure (Hitchcock, Meyer, Rose, & Jackson, 2002).

Besides, several practitioners and researchers consider interactivity as the essential mechanism for effective and successful self-regulated learning within web-based learning environments (Kim, 2009; Nedal & Alcoriza, 2018; Reisslein et al., 2007; Tawfik et al., 2018). In addition, interaction in web-based learning has been reported

to help students develop skills and knowledge (Borup, Graham, & Davies, 2013), increase engagement (Hagenauer & Hascher, 2010), and satisfaction (Alqahtani, Innab, & Bahari, 2021).

Moreover, it is also evident that lecturers can enhance students' mood or demotivate them based on the methodology used in teaching (Jiang & Dewaele, 2019). Lecturers' support can help students create a positive learning environment (Aymans, Kortsch, & Kauffeld, 2020). A lecturer can design interactive programs, interesting audios, and videos to make learning fun and increase students' interest, leading to learners' enjoyment (Shawkat Mohammed, 2021; Tsai & Jack, 2019). Simultaneously, previous research also provides evidence that injustice and bias can create negative feelings and lower students' performance levels (Co-operation & Development, 2010). Besides, literature indicates that equity is a fundamental factor in promoting a healthy functioning environment (Lowell & Morris Jr, 2019). However, very few studies have focused on the relationship between equity and learner enjoyment, which has been examined in the current study.

Investigation within technology-based environments helps students become problem solvers and create new avenues for exploration (Scanio, 2021). Research shows that investigation in learning can help address ambiguities, reduce room for error, and improves understanding of content (Moeed & Rofe, 2019). Moreover, research indicates that queries and puzzle-solving exercises used in gamification can further help to increase student level of interest and, in turn, results in learners' enjoyment (Gorard & See, 2011). Hence, based on the evidence from literature and Environmental Learning Theory, the following hypothesis is suggested:

*H2: There is a positive impact of access to learning, interaction, lecturer support, equity, and investigation on learners' enjoyment.*

#### *Learners' Enjoyment and Learners' Achievement*

E-learning and technology-based apps have been found to generate positive emotions in their users due to increase engagement, sense of control, and interactive programs (Lee & Lee, 2021). Past researches have pointed towards fun relevant and socio-constructivist learning environments, achieved through various web-based programs using animation, flexibility, and interactive activities (Mierzwa, 2019). Moreover, learners' achievement has been defined as the acquisition of knowledge and skills developed by subject matter, as indicated by test scores administered by lecturers (Brooks et al., 2021).

Studies also indicate that students' level of enjoyment in online learning relates to their sense of satisfaction with their performance (Fu, Su, & Yu, 2009; Schukajlow, Blomberg, Rellensmann, & Leopold, 2021). Simultaneously, Bashori et al. (2021) pointed out that enjoyable learning is more effective than boring ones. Moreover, feelings of fun in learning have been associated with students feeling enthusiastic,

motivated, and inclined to contribute towards achieving learning goals (Orrell, 2006). Hence, it is proposed that,

*H3: There is a positive impact of learners' enjoyment on their achievement.*

#### *The Mediating Role of Learners Enjoyment*

Previous literature shows that the web-based learning environment is built upon collaborative learning techniques and scaffolding to enhance learners' competency in higher education (Yen & Lee, 2011). Moreover, web-based learning presents new standards and measures for learner's achievement, including participation, feedback, online quizzes, and test scores, and skills utilized to do so (Blandford & Knowles, 2013). Therefore, access to learning requires students to utilize all the necessary information, knowledge, and skills that can aid in their learning activities (Taylor & Spaul, 2015). Besides, learners' enjoyment requires drawing upon the entertainment-education paradigm created through computer-aided interactive test modules designed for students (L. Zhang & Tsung, 2021). Moreover, literature provides strong evidence of fun-based learning to reduce stress and anxiety in students (Hagenauer & Hascher, 2010). Therefore, students who have access to these interactive programs can derive a sense of pleasure while working towards achieving their academic targets.

In addition, interaction revolves around increasing engagement, communication, and understanding between the lecturer and student and peers (Kim, 2009). Interaction helps increase students' involvement with course content (Saeed et al., 2016). Besides, learner enjoyment plays a great role in social education embedded learning (Noman, Kaur, & Nafees, 2021). Research also shows that activity-based e-learning programs that target students' IQ level and emotional intelligence help increase learner's achievement through enhancing their sense of enjoyment (Demir & Akpınar, 2018). Moreover, teachers' enthusiasm during lectures has been considered contagious in stimulating positive emotions in students towards achieving learning objectives (Im & Kang, 2019).

Research also shows that teachers can create a positive and fun environment utilizing various tools in the online setting, leading to increased engagement (Fetaji, 2008). Likewise, equity has been reported to enhance the learners' achievement, requiring instructors to carefully design activities addressing the cultural context and providing equal opportunities for males and females (Lowell & Morris Jr, 2019). Moreover, previous studies also indicate that Problem-based projects are successfully connected to their class members (Yang & Wu, 2021). They enable active inquisition among them, which fosters learning (Scanio, 2021). Regardless of the above evidence regarding the impact of various factors of web-based learning on students' engagement, performance, and achievement, to the best of the authors' knowledge, no study to date has examined the mediatory role of learners' enjoyment between the web-based learning factors and learners' achievement.

Hence to address this literature gap, based on the above discussion and Environmental Learning Theory, it can be proposed that learners’ enjoyment can enhance learners’ achievement, by creating a just and fair study program for students in web-based learning environment. Hence, we can propose that,

*H4: Learners’ enjoyment mediates the association of access to learning, interaction, lecturer support, equity, and investigation with learners’ enjoyment*

### Theoretical Framework of the Study

Figure 1 presents the theoretical framework of the study that show the relationships between the independent and dependent variables.

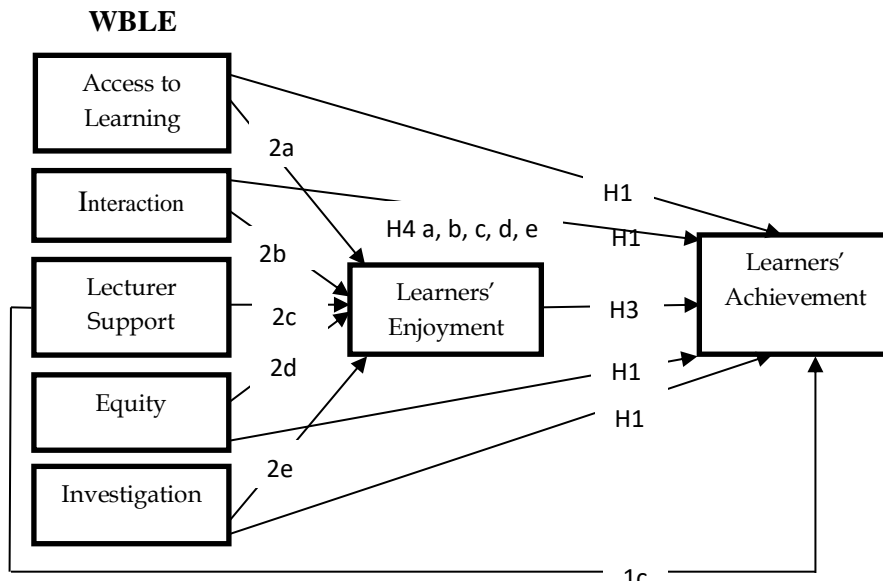


Figure 1. Theoretical Framework of the Study

### Methodology

#### Research Design

Indonesian students are considered among the globally highest IT suites or computer room users (40%) (Fauzi & Asri, 2021). They are also the second-highest globally for using desktop computers (54%), behind only the USA (Fauzi & Asri, 2021). The researchers adopted a survey-based research design based on a time-lag survey method. There are three major universities in the Bengkulu city in Indonesia. The



researchers obtained the list of online teaching programs from them to construct the survey.

#### *Research Sample*

The target population consisted of university students enrolled with online programs encompassing web-based learning, both male and female, belonging to various ethnic backgrounds. The sample was identified using the random sampling method from Bengkulu city in Indonesia.

Right at the outset, the researchers contacted the program coordinators of the online programs to obtain the list of students enrolled in programs. The researcher explained to them the purpose of conducting the study, and they were also ensured that obtain data will not be shared with any third party at any stage and will be used only for research purposes. About 1000 enrolled students agreed to participate in the study who were explained the purpose of the study, and were assured strict anonymity of their responses. Those who had agreed to participate were further asked for their English language proficiency, and only those who were good at reading and understanding English were considered for this research participation.

#### *Research Instruments and Procedure*

A questionnaire consisting of 35-items was used to collect the responses for the current study. The web-based learning environment was assessed using an Online classroom learning environment inventory scale adapted from (Rahayu et al., 2021a). It was ensured that the scales should be in English, with good reported reliability. The scale had five items for all the 05 constructs of WBLE, i.e., access to learning, interaction, lecture support, equity, and investigation. Learners' enjoyment was measured with a 6-items scale adapted from (Maheshwari, 2021). Finally, to measure the students' achievement, the process used by Oczlon, Bardach, and Lüftenegger (2021) was followed. Responses were reported on a 5-point Likert Scale ranging from 1= strongly disagree to 5 = strongly agree. Students were requested to report their most recent grades for three subjects (depending upon the specialization of the students) which were averaged across the three subjects and used as indicators of their achievement. Responses were recorded as "1= lowest grade and 5 = best grade".

The first part of the questionnaire comprised demographic characteristics of the individuals, including age, gender, degree enrolled, program, designation, experience, subject studied online was investigated. At the same time, the second part consisted of the survey items related to the study constructs, such as access to learning, interaction, lecturer support, equity, investigation, and enjoyment. The first and the second parts were sent to 1000 respondents on September 01, 2020. After four weeks of the dispatch of the questionnaire, the authors sent a soft reminder to those who had not responded. In a twelve-week time, after sending two reminders, the authors received 729 filled responses over the period of three months. The third part of the survey was sent to these 729 respondents on February 01, 2021, including items related to learners'

achievement. It was a Time 2 survey, which was completed in two months, before the authors decided to close the data collection on April 05, 2021. Out of the 592 paired responses received, after careful screening, 24 responses were found with missing values, and 26 had unengaged patterns; therefore, they were not included in further analysis. Thus, a total of 542 responses were considered for this study, as all three parts of these were successfully filled by study respondents, with a final response rate of 54.02% in a data collection duration of 7 months.

#### *Data Analysis*

Smart PLS 3.0 software was used for purpose of analysis. Results revealed that respondents' study level had a significant impact on their achievement. Cronbach's  $\alpha$  (CA) and composite reliability (CR) were calculated to assess the reliability of measures (Henseler, Ringle, & Sinkovics, 2009; Mansoor & Noor, 2019).

### **Results**

Demographic characteristics of the respondents depicted no significant difference between the number of male (51.5%) and female (48.5%) students. Most of the participants were between the age bracket of 21-25 years totaling 49.10%. There was a diverse distribution of participants in terms of semesters they were studying, i.e., 25.4% of students were studying in semesters 1-2, 23.5% in semesters 3-4, 37.1% in semesters 5-6, and the remaining 14% students were studying in semesters 7-8. Besides, most participants (54.9%) reported spending 4-6 hours online per week for each course. Finally, many of the respondents were graduate-level students (53.5%), 27.3% were undergraduate level students, and the remaining 19.2% were studying at the postgraduate level.

Table 1 shows the values of CA and CR above 0.70. For all other indicator variables, factor loadings were greater than 0.70, and the average variance extracted (AVE) of latent variables was above 0.50 for all study constructs; hence, convergent validity was established (Sueca, Sumertha, & Winaja, 2021). The Heterotrait-Monotrait (HTMT) ratio was also measured since it is the most appropriate measure of discriminate validity (Henseler, Ringle, & Sarstedt, 2015; Noor, Mansoor, & Rabbani, 2021). The HTMT ratio is presented as the cut-off value, i.e., 0.9 for the entire model (Table 2).

#### *Structural Model and Hypothesized Paths*

The Bootstrapping technique was performed to assess the structural paths, and 500 sub-samples were used to test the hypothesized links (Noor et al., 2021). B-coefficient, t-value, and p-value were recorded to confirm the hypothesized relationships. Simultaneously, the Coefficient of Determination (R<sup>2</sup>) depicted a 69.5% change in the achievement due to all direct variables and mediating variables. R<sup>2</sup> values reflect good model fitness.

Moreover, table 3 shows the results of the direct as well as an indirect hypothesis. Results revealed a positive and significant impact of access to learning ( $\beta = .236^{***}$ ,  $t =$

4.956), interaction ( $\beta = .296^{***}$ ,  $t = 6.485$ ), lecturer-support ( $\beta = .232^{***}$ ,  $t = 4.812$ ), equity ( $\beta = .273^{***}$ ,  $t = 5.934$ ), and investigation CP ( $\beta = .181^{**}$ ,  $t = 3.745$  on learners' achievement. The results also showed a positive and significant impact of access to learning ( $\beta = .283^{***}$ ,  $t = 6.188$ ), interaction ( $\beta = .337^{***}$ ,  $t = 7.574$ ), lecturer-support ( $\beta = .206^{**}$ ,  $t = 4.021$ ), equity ( $\beta = .222^{***}$ ,  $t = 4.369$ ), and investigation CP ( $\beta = .192^{**}$ ,  $t = 3.857$ ) on learners' enjoyment. Likewise, the impact of learners' enjoyment on their achievement was positive and significant ( $\beta = .214^{***}$ ,  $t = 4.262$ ). Hence, hypotheses H1 a, b, c, d, and e; H2 a, b, c, d, and e; H3 of the current study were supported by results. All impact sizes are also shown in Figure 2.

The mediation hypotheses H4 a, b, c, d, and e were also supported. An indirect and positive effect of access to learning ( $\beta = .211^{**}$ ,  $t = 4.107$ ), interaction ( $\beta = .187^{**}$ ,  $t = 3.897$ ), lecturer-support ( $\beta = .251^{***}$ ,  $t = 5.451$ ), equity ( $\beta = .178^{**}$ ,  $t = 3.471$ ), and investigation CP ( $\beta = .195^{***}$ ,  $t = 3.908$  with Learners' achievement in the presence of learners' enjoyment as mediator was also proved true. The significance levels are shown in Figure 3 and Figure 4 summarizes the results of all hypotheses.

**Table 1**

*Summary of Measurement Model Assessment*

Constructs	Items	Loadings	AVE	CR	Cronbach's Alpha
Access to Learning			0.581	0.874	0.818
	ATL1	0.790			
	ATL2	0.731			
	ATL3	0.805			
	ATL4	0.770			
	ATL5	0.710			
Interaction			0.548	0.858	0.789
	INT1	0.715			
	INT2	0.731			
	INT3	0.815			
	INT4	0.723			
	INT5	0.711			
Lecturer Support			0.625	0.892	0.841
	LS1	0.775			
	LS2	0.773			
	LS3	0.724			
	LS4	0.860			
	LS5	0.813			
Equity			0.567	0.867	0.802

**Table 1**  
*Continues*

	EQT1	0.740			
	EQT2	0.709			
	EQT3	0.788			
	EQT4	0.771			
	EQT5	0.755			
Investigation			0.605	0.884	0.826
	INV1	0.853			
	INV2	0.785			
	INV3	0.744			
	INV4	0.771			
	INV5	0.729			
Learners' Happiness			0.591	0.878	0.815
	LH1	0.767			
	LH2	0.815			
	LH3	0.717			
	LH4	0.754			
	LH5	0.787			
	LH6	0.803			
Learners' achievement			0.598	0.817	0.775
	LA1	0.740			
	LA2	0.788			
	LA3	0.791			

Note: CR, composite reliability; AVE, average variance extracted.

**Table 2**

*Heterotrait-Monotrait Ratio*

<b>Constructs</b>	<b>Mean</b>	<b>STD.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
ATL	3.96	0.90	<b>0.762</b>						
INT	3.83	1.09	0.509	<b>0.740</b>					
LS	4.02	0.91	0.327	0.379	<b>0.790</b>				
EQT	3.98	1.03	0.517	0.413	0.471	<b>0.752</b>			
INV	3.81	1.11	0.481	0.521	0.471	0.377	<b>0.777</b>		
LH	3.72	1.21	0.398	0.517	0.453	0.393	0.321	<b>0.768</b>	
LA	3.87	0.98	0.402	0.390	0.382	0.411	0.560	0.400	<b>0.773</b>

Note: The square roots of AVEs of the constructs are shown in bold in diagonal. Where: ATL= Access to Learning; INT= Interaction; LS = Lecturer Support; EQT= Equity INV= Investigation; LH = Learners' Happiness; LA= Learners' Achievement.

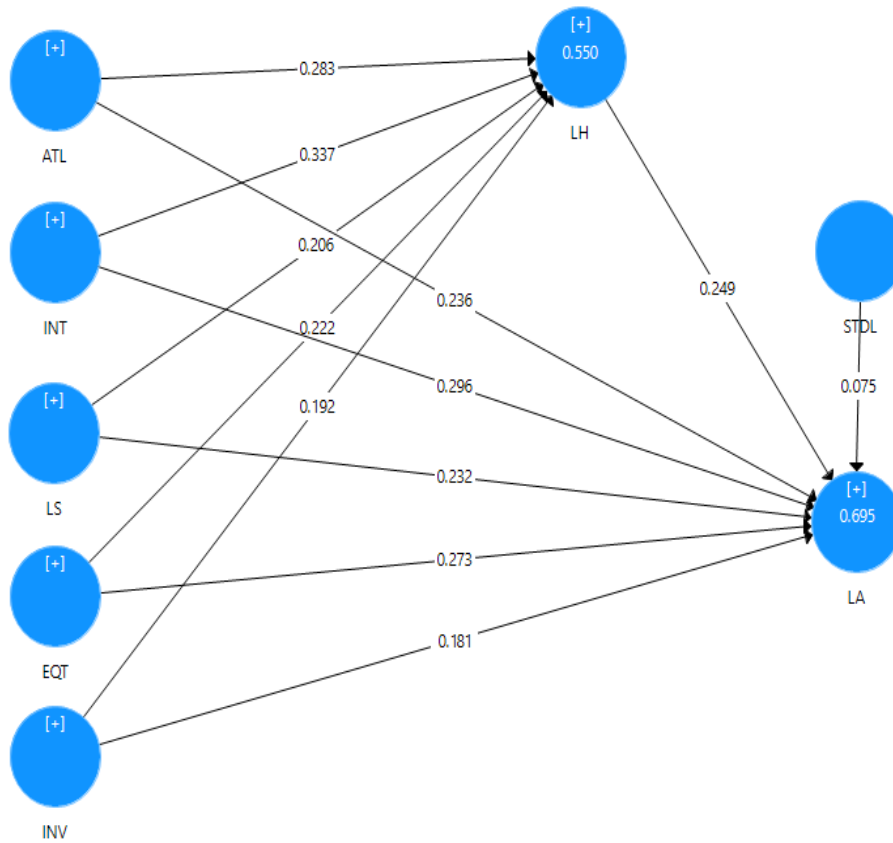


Figure 2. Full Measurement Model

Table 3

Hypothesis Testing Results

	Hypotheses	Std. Beta	t-Value	p-values	Supported
H1a	ATL → LA	0.236	4.956	0.000	Yes
H1b	INT → LA	0.296	6.485	0.000	Yes
H1c	LS → LA	0.232	4.812	0.000	Yes
H1d	EQT → LA	0.273	5.934	0.000	Yes
H1e	INV → LA	0.181	3.745	0.009	Yes
H2a	ATL → LH	0.283	6.188	0.000	Yes
H2b	INT → LH	0.337	7.574	0.000	Yes
H2c	LS → LH	0.206	4.021	0.001	Yes

H2d	EQT→ LH	0.222	4.369	0.000	Yes
H2e	INV→ LH	0.192	3.857	0.005	Yes
H3	LH→LA	0.249	5.358	0.000	Yes
H4a	ATL→LH→LA	0.211	4.107	0.000	Yes
H4b	INT→LH→LA	0.187	3.897	0.007	Yes
H4c	LS→LH→LA	0.251	5.451	0.000	Yes
H4d	EQT→LH→LA	0.178	3.471	0.011	Yes
H4e	INV→LH→LA	0.195	3.908	0.005	Yes

Where: ATL= Access to Learning; INT= Interaction; LS = Lecturer Support; EQT= Equity INV= Investigation; LH = Learners' Happiness; LA= Learners' Achievement.

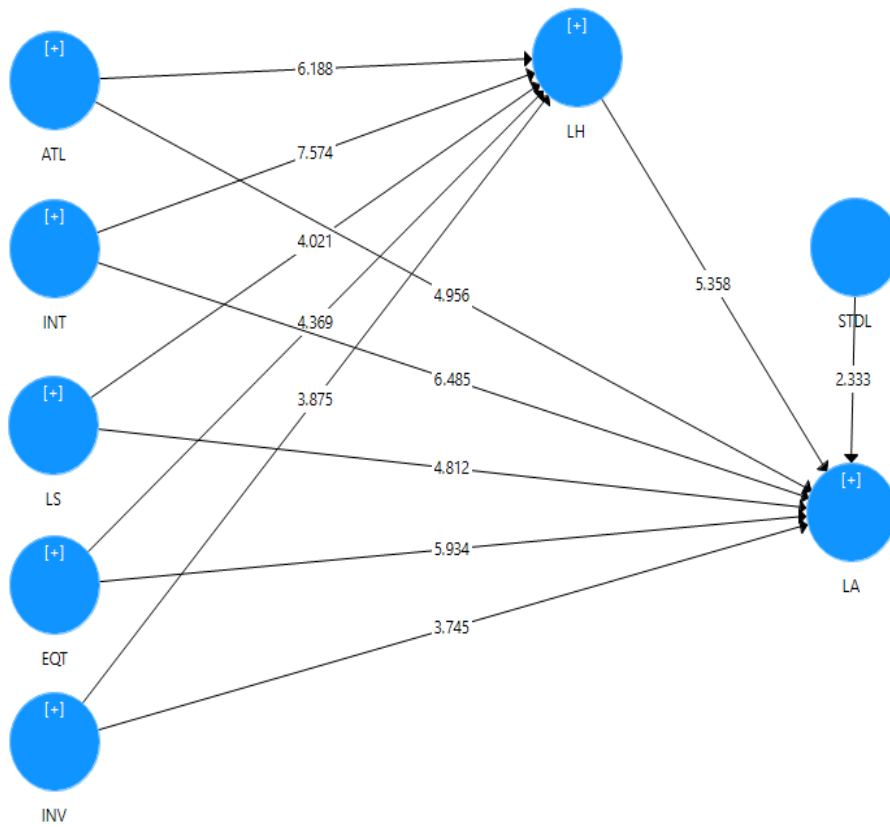


Figure 4. Full Structural Model

## Discussion

Web-based learning offers various advantages and strengths in today's evolving technological era (Marini et al., 2021). Therefore, it was important to analyze how various factors can affect students' achievement in context of web-based learning. Regardless of studies focusing on online and e-learning, the literature lacked evidence of how a web-based learning environment could be constructed to enhance learners' enjoyment, leading to improved learners' achievement. This study is incremental to address this vital issue and contribute to the domain of educational management. The implementation of the environmental learning theory further revealed that students shape their attitudes by taking information from the environment and utilize it to improve their work performance (Sims, Inwood, Elliott, & Gerofsky, 2021).

The current study utilized five dimensions of a web-based learning environment, namely access to learning, interaction, lecturer support, equity, and investigation. Previous research also studied these dimensions under the online classroom learning environment inventory (Rahayu et al., 2021b); however, this study had a different focus. It focused on the learners' enjoyment and achievement for the programs taught through websites and other technological tools for increased interactivity among university students. The findings of this study suggest that, regardless of the methodology used, the chosen variables of the study-- access to learning, interaction, lecturer support, equity, and investigation remain important factors in learning. These factors enable the student to evolve, explore, engage, and evaluate knowledge provided to them. These findings also support the use of the multidimensional model for both online learning environments, which is consistent with previous studies (Fu et al., 2009; Meyers, 2006).

The results revealed that all the five web-based learning environment factors were positively associated with learners' achievement. Besides, specifically, the results also indicated that the impact of interaction and equity on learners' achievement was higher, followed by lecture support, access to learning, and investigation. This implicates that communication between students and teachers helps them clear ambiguities, improves understanding, and boosts the morale of students, which is consistent with (Xhomara, 2020). This has also been observed that when the assessment tools get complex, students compete for better grades, test scores, and problem-based projects; they require lecturer support and interaction to better function and perform (Soffer, Kahan, & Nachmias, 2019). Eventually, access to learning is critical as it allows for disseminating information and knowledge necessary to learn course-related content, affecting learners' achievement (Margaret, 2021). Furthermore, the study's results depicted the positive impact of the five dimensions of a web-based learning environment with learners' enjoyment that have not been studied previously. It was found that learners' enjoyment aroused positive feelings of enthusiasm, motivation, and satisfaction, leading to enhanced academic performance, consistent with previous studies (Dewaele & MacIntyre, 2019; Wasike, 2017).

Indonesia has implemented web-based technology and incorporated e-learning in its higher education, it was therefore important to analyze how these five dimensions affected students' enjoyment and achievement in Indonesian cultural context (Fauzi & Asri, 2021). The impact of access to learning and interaction on learners' enjoyment was highest, followed by lecturer support, equity, and investigation. Hence, results depicted the importance of the necessary equipment and facilities to access the learning activities. Likewise, results also supported the notion that students enjoyed the lectures more when the online learning sessions were more interactive and fund oriented. In addition, results showed that learners' enjoyment enhanced achievement among students and helped them improve their mental and emotional well-being to better focus on learning and achieving learning objectives (Dewaele, Witney, Saito, & Dewaele, 2018).

It is a well-known fact that performance expectations, and compliance of standards and goals can set a lot of pressure and fear among students. It is important to provide them with enough resources and a healthy environment to motivate them to excel. Advancing to the body of literature, this study found that learner's enjoyment mediated between the five dimensions of a web-based learning environment and learners' achievement. It was discovered that learner's enjoyment helped boost the morale, create a positive learning environment, and helped students feel valued to derive a sense of pleasure from learning (Widhanarto, Prihatin, Widyarningsih, & Ahmadi, 2021). At the same time, instructors could also increase learning-based fun activities by designing courses and lectures that are interesting, entertaining, and educational at the same time using web-based tools.

### **Conclusion, Recommendations and Implications**

To conclude, it may be reiterated that previous researchers have mostly focused on accessibility for students with disabilities, as web-based learning content can be text-based and require comprehension and reading (Hitchcock et al., 2002; Hui-Chun, 2014; Khushnud & Qingjie, 2020). In contrast, the current study revealed that access to learning is positively associated with learners' enjoyment and that it improved students' accessibility to tools and programs that increased their interest and helped them derive a sense of pleasure. Similarly, the current study uniquely investigated the impact of interaction on learners' enjoyment, and achievement, a variable that has been least explored. The role of lecturer support was also investigated and was found to be incremental in improving learners' enjoyment and achievement. This study also explored how equity was related to learners' enjoyment, and how it helped provide students just and fair opportunities that were culturally sensitive and equal towards all students regardless of their gender and ethnicity. Additionally, the study revealed how investigation helped improve learners' enjoyment, leading to more achievements through inquiry, interest, and logical reasoning.



This study also negated those authors who believed that entertainment distracted students in higher education (Bashori et al., 2021; Pavelescu & Petric, 2018) but contrarily, this study revealed that students liked fun-based quizzes, animation, and graphics to stimulate interest. It was also revealed that web-based and online learning are conducted for distance education, but equity allowed international students to feel inclusive and valued and aid in improving their overall performance. Finally, this study specifically provided contextual evidence from Indonesian cultural context which is a contribution to the existing literature.

This study has various theoretical contributions towards literature that researchers and scholars may utilize to further extend the field. This study's first and foremost contribution is revealing and establishing a multidimensional framework and its impact on learner's enjoyment, which has not been previously explored in literature. As many authors realize its importance in engaging students and improving their interest in learning, few have explored it concerning the multidimensional elements of the web-based learning environment. Another contribution of this study was using the theoretical foundation of environmental learning theory, which has not been previously explored in the literature to explain how the web-based learning environment dimensions can impact learners' involvement, enjoyment, and achievement. Previous studies have utilized it to address environmental issues and develop sensitivity among students concerning environmental problems (Ballantyne et al., 2018; Li, Liu, & Soutar, 2021). In contrast, this study is incremental to develop understanding about factors affecting web-based learning in students and affecting their achievement.

There are various practical implications too of this study. This study would help educators and practitioners understand the importance and critical role of incorporating learners' enjoyment to improve overall performance, achieve learning outcomes, and build a healthy learning environment. Policymakers in education, especially in developing countries, would now understand the benefits of online and web-based learning, that it can be cost-effective, it can promote distance education and help improve interactivity among students. The policymakers would also learn how to help design programs that promote equity among all students. They should introduce fun-based programs in highly complex and anxiety-prone study programs such as GAT, SAT, and other such exams to help reduce students' anxiety and feelings of distress. The instructors and educationists would also now feel the need to develop and design programs that would help build students' interest. Instructors would now incorporate interactive programs in order to tap students' interest to teach study material to improve their performance. Such fun-based learning games through gamification, interactive quizzes, and online assessments would be designed and delivered that would make learning fun. By incorporating such entertainment-based problem-solving programs, they could help boost learners' cognitive skills.

Although this study covered in detail the multidimensional framework for a web-based learning environment to study its impact on learners' enjoyment and

achievement, there are still few drawbacks that need to be addressed in future. The first limitation is that this study lacked information on how the complexity of web-based learning affected students' performance, which future studies can address. Another greatest barrier in online and web-based learning is the network problems, which this study did not explore. Future studies can help focus on this issue and develop programs that can help address barriers to communication in future. Finally, the current study was conducted in a developing country that faces many issues regarding resources to design, monitor, and execute entertainment-based learning programs, which was not explored in this study. This issue should be further investigated to address how scarcity of resources can be addressed for both learners and faculty members. The scarcity of networks and how equipment influences the enjoyment and achievement of web-based learning systems can also be an area of attention for future scholars in the education management field.

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