The Effect of UIUX Design of Artificial Intelligence E-Learning System on Student Learning Engagement

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Abstract

Currently, e-learning has been widely used in the learning process. This is inseparable from the advantages of e-learning which allows learning to be done anytime, anywhere even with minimal instructor involvement or even no instructor involvement. The challenge in developing e-learning is how the learning process remains interesting and motivates students to remain fully involved in the learning process. In this study evaluated how the effect of UI/UX design on e-learning on AI learning that has been designed in previous research on learning engagement. The evaluation process was carried out comparing the value of student engagement in the previous AI e-learning with AI e-learning that had implemented the UI/UX design that had been designed. The value of student engagement is measured using the Online Student Engagement (OSE) matrix for skill and emotional indicators. Based on the results of the evaluation, it was concluded that UI/UX design can increase learning engagement on e-learning AI that was built with an average increase of 10.13% for skills indicators and 11.12% for emotional indicators.

Keywords *— UI/UX, E-Learning System, Student's Engagement, AI E-Learning System*

1. INTRODUCTION

E-learning has now become a common thing to be used as a medium for student learning. E-learning is a new way of delivering material, both teaching and learning and sharing knowledge using the internet as a learning system so that it can be used anywhere and anytime. This causes conventional classroom education to be replaced with online learning, thus affecting educational practice [1]. One of the challenges of educational practice faced in online learning using e-learning is that student engagement cannot be controlled [2]. Reference [3] shows that some students stop using e-learning after their initial experience, this shows that user satisfaction and experience is one of the important factors to support student involvement in learning using e-learning.

Student engagement relates to the interaction between time, effort, and other relevant resources invested by students to optimize their experience and improve learning outcomes and self-development [4]. According to [5] student engagement in e-learning system is how students use their time and energy to learn materials and skills, demonstrate learning, build meaningful interactions with other students, and enjoy the learning process through e-learning system. There are 4 factors that build student engagement in online learning, namely the ability to learn (skills), feelings in learning (emotional), behavior in learning (participation/interaction), and performance in learning (performance). Reference [6] suggests that increasing student engagement can be done by provide a varied forms of learning

materials and exercised and applying gamification in e-learning. In-depth research is needed to students so that the results are effective and in accordance with the needs of students.

UX has a significant impact in seeking user satisfaction [7]. The role of UX in building e-learning can also keep students engaged with e-learning [8]. Based on the definition of ISO 9241-210 [9], UX includes the preferences, perceptions, emotions, beliefs, physical and psychological responses, behaviors, and user achievements that occur before, during and after the use of a product. Therefore, the success of e-learning is highly dependent on the user's experience and perception of the system [10], so that student engagement in e-learning can be improved by UX analysis. UX design certainly cannot be separated from UI design. In UI design, the focus of attention will be on how the proportions are appropriate, topology, color selection, symbols and others. The better the UI design, the easier it will be to realize a good UX design. Therefore, the study of UX is never separated from the study of UI.

Based on this background, this research analyzes how the effect of UI/UX design on e-learning on increasing student engagement. So that the contribution generated from this research is the result of an analysis of the influence of UI/UX design, especially for e-learning AI on student engagement using the Online Student Engagement (OSE) matrix. Students Engagement indicators that will be evaluated are skills and emotional indicators. These two indicators are engagement indicators that best suit the features available in AI E-learning that currently build. Each indicator is divided into several sub-indicators, so that from the results of the analysis carried out it can be seen in more detail which indicators are most influenced by the UI/UX design that has been built. By knowing the indicators that are most influenced and which are least influenced, it will be a consideration in the development of the next UI/UX design.

Furthermore, to clarify the process and contribution of this research, this article will be organized into several sections. The section II presents a theoretical study that is the background that supports the research. The section III is the method carried out and the IV section will show the results and discussion of the results. In section V, the conclusion concludes the main part of this article.

2. THEORITICAL BACKGROUND

A. UI/UX Design

User Interface (UI) and User Experience (UX) are part of the human-computer interaction (HCI) field of study. HCI is how computers and people work together so that one's needs are met in the most effective way [11]. UI and UX are two different things. UI is a means of human interaction with applications or products in completing certain tasks and focuses more on visual or display aspects such as typography, colors, layout, buttons, and others. UI is an important part of application development because it relates to the user, can be seen, can be touched, and can be heard [11]. A good UI design is one that can function according to its use, not only considering the aesthetic aspect.

In contrast to UI, according to the definition of ISO 9241-210 [11]), UX are psychological responses, emotions, beliefs, preferences, perceptions, physical, behavior, and user achievements that occurs before, during and after the use of a product. A good UX can meet user needs precisely by making it simple and elegant so as to produce a product that is fun to have. To achieve this requires a UX design. UX design define as a digital products or designing physical process that make it more useful, easy to use, and provide a great experience in interacting with users. UX design is not good if users have difficulty using the product and need a user guide to use the product [12].

B. Student Engagment

Student engagement is how student invest their effort, time, and other relevant resources to optimize their experience and improve learning outcomes and self-development [4]. Reference [5] explained student engagement is how students are actively involved in thinking, speaking, and interacting with learning materials, other students, and instructors. Student engagement has gone through a one-dimensional process to multi-dimensional, early research on student engagement tends to focus only on the behavioral (behavioral) dimension, then emerges the emotional (emotional) and cognitive (cognitive) dimensions. Behavioral engagement is a basic engagement that is easy to see explicitly and can be observed, especially the special behavior of students in the learning process. Cognitive engagement refers to the use of learning strategies, that is, students try to control mentally in learning process. Uses different learning strategies will lead to different levels of students thinking. Emotional engagement refers to the emotional reactions of learners, including interest, boredom, happiness, sadness and anxiety.

The development of technology, which is marked by the inclusion of technology in education as online learning, has changed the view of student engagement in learning activities. Student learning engagement is the students' involvement in using time and energy to learn materials and skills during the learning process, demonstrating learning, build meaningful interactions with other students, and enjoy the learning process [5]. Based on the above definition, it can be concluded that in this study, student engagement is the effort given by students in the form of time, energy, and other relevant resources to gain experience by learning materials and skills and demonstrating them so that learning outcomes can increase because students enjoy the learning process.

C. Online Learning Engagement

Research conducted by [5] becomes a reference for student engagement theory because the study discusses student engagement in online learning, this is in accordance with this study because it aims to measure student engagement in learning using e-learning.

Student's engagement in online learning has four factors : emotional, skills, performance and participation/interaction, [5]. Emotional is a feeling in learning, such as applying learning materials in everyday life and enthusiastic about learning the material. Skills are learning abilities, such as studying regularly, listening to explanations well, reading carefully, and taking notes. Performance is the result of learning, such as getting good grades

and do well on tests/quizzes. Participation/interaction is behavior, such as being actively involved in group discussion forums and helping other students. These four factors are packaged as the Online Student Engagement Scale (OSE). OSE will be used in this study as an indicator of student engagement measurement.

Table 1. Online Student Engagement Scale [5]

Skills	Emotional	Participant	Performace
a. Study regularly b. Stay up on c. Reading d. Look over class notes e. Be organized f. Listen/read carefully g. Take good notes over readings, PPT, Video, lectures	a. Put forth effort b. Find ways to make materials relevant c. Apply to my life d. Find ways to make material interesting e. Really desire to learn	a. Have fun in online chats, discussions or via email with the instructor or other students b. Participate actively in forums c. Help fellow students d. Engage in online conversations e. Post regularly in forum	a. Do well on tests b. Get good grades

3. RESEARCH METHOD

To determine the effect of UI/UX design on student's engagement of AI learning with e-learning, an evaluation scenario was designed by comparing the results of measuring student learning engagement on simple e-learning with the results of measuring learning engagement on e-learning that implements the designed UX/UI design.

A. Learning Engagement Questionnaire

The form of the questionnaire designed to measure student engagement in this study is based on online student engagement (OSE) developed by [5]. In the OSE there are 19 statements, each statement will represent an indicator of one of the four factors of student engagement. Because this study will only measure the skills and emotional indicators of students, the number of statements used is 11 statements.

Statements of skills and emotional indicators on OSE can be seen in Table 1 and there are also modifications to these statements used in this study. Modification of the statement is used to make it easier for students to answer the statement, the modification made is to translate the OSE statement and also add a few words to make the statement easier to understand.

Table 2. Questions For Learning Engagement Questionnaire

Indicator	Sub-indicator	OSE Question	Modified Question
Skills	Study Regularly	Making sure to study on regular basis	(Q1) E-learning motivated me to study regularly about AI
	Staying up on reading	Staying up on readings	(Q2) I read all materials about AI on E-learning
	Look over class note	Looking over class notes between getting online to make sure I understand the material	(Q3) I am looking over class note/highlight the materials on e-learning between getting online class make sure I understand
	Be Organize	Being Organized	(Q4) I organized my learning process to ensure all the material about AI and processes will be done on time
	Listen/read	Listening/reading carefully	(Q5) I read all the materials and instructions carefully
	Take good notes over readings, PPT, Video, lectures	Taking good notes over readings, PowerPoints, or video lectures	(Q6) I take good notes over reading AI learning materials in e-learning
Emotional	Put forth effort	Putting forth effort	(Q7) During learning process, I am focus on all learning processes and learning materials on e-learning
	Find ways to find out the relevant	Finding ways to make the course material relevant to my life	(Q8) I find that the learning materials about AI are relevant to my life
	Apply to my life	Applying course materials to my life	(Q9) I am applying AI solution to design a solution of my real live problem
	Find ways to make material interesting	Finding ways to make the course interesting to me	(Q10) I found that AI is interesting
	Really desire to learn	Really desiring to learn materials	(Q11) I desired to learn AI further

In answering the statements in Table 1, a Likert scale of 1-5 is used. The student engagement questionnaire was created using the google form application.

B. Data Collection

The questionnaire data collection survey was conducted to obtain the level of learning engagement for e-learning AI before implementing UI/UX design and e-learning AI after implementing UI/UX design. Users of the e-learning that was built were students of SMK RPL in Bandung, Indonesia as many as 32 students. The background of the user is familiar with computers and already familiar with basic programming but not much knowledge about Artificial Intelligence. All materials and learning processes designed in both e-learning are the same. During the learning process with built e-learning, students are still accompanied by instructors.

4. RESEARCH RESULTS AND DISCUSSION

Figure. 1-3 are the samples of UI/UX of E-learning of AI that have been build in this research.

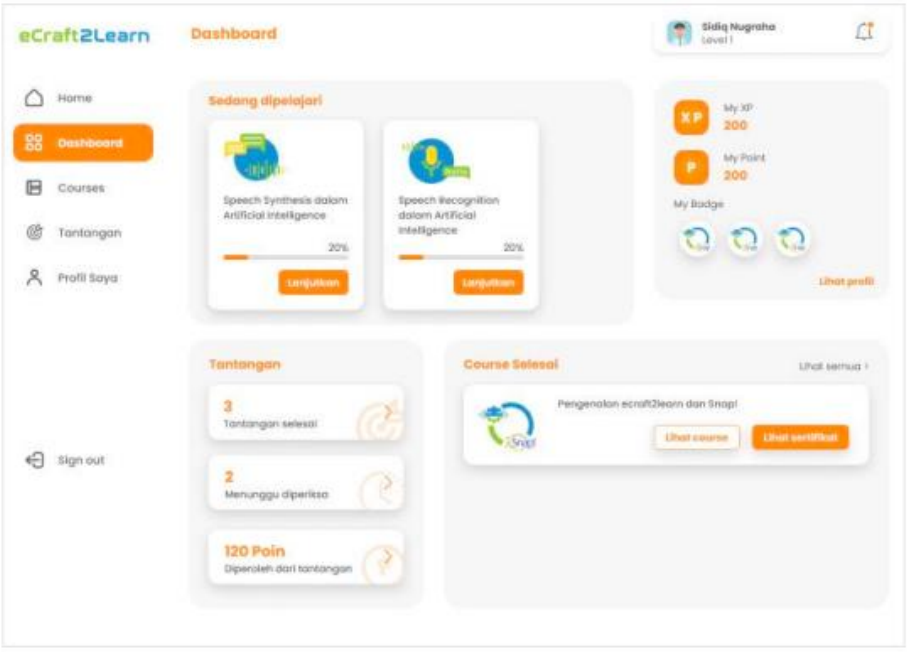

Figure 1. Dashboard page of E-learning of AI

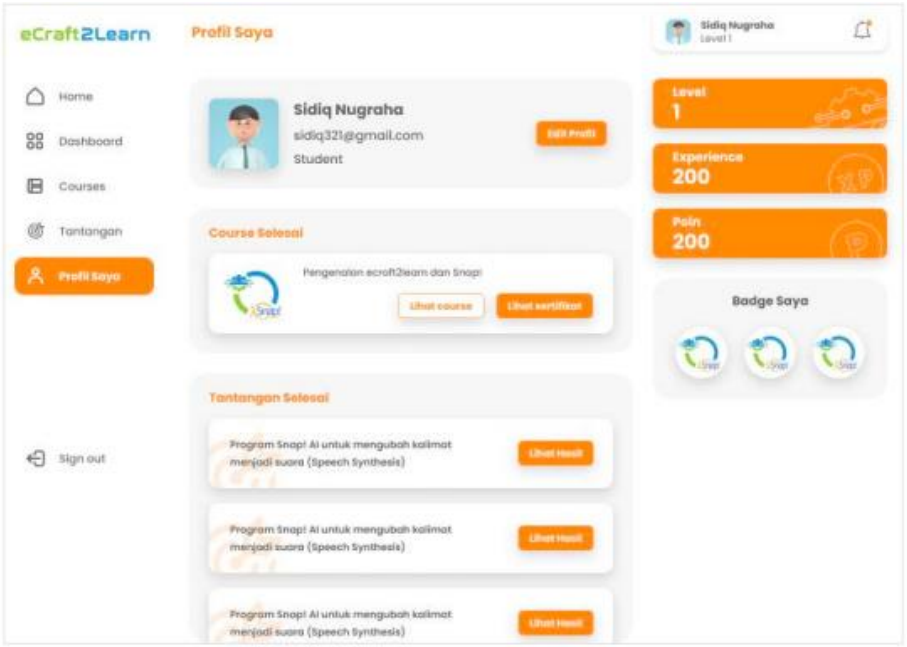

Figure 2. Profile page of E-learning of AI

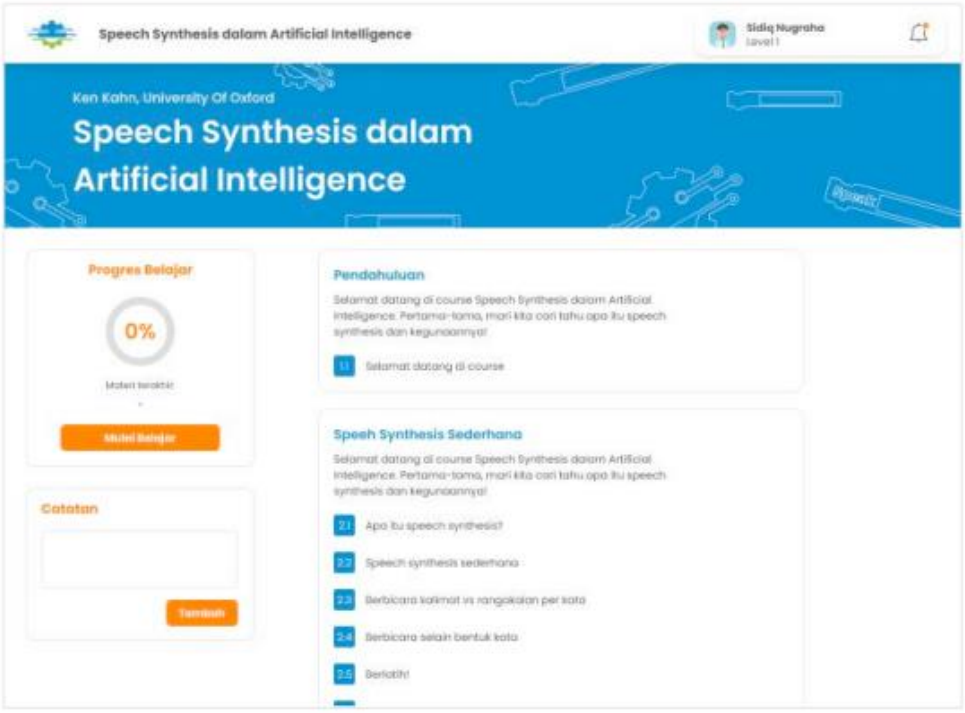

Figure 3. Learning material page of E-learning of AI

Figure. 1 and Figure 2 are comparisons of the proportion of learning engagement levels. In accordance with the design of the questionnaire questions that have been made, there are 5 levels of learning engagement that are measured for each question asked. Level 1 is strongly disagree, level 2 is disagree, level 3 is neutral, level 4 is agree and level 5 is strongly disagree. In the graphic Figure. 1 and Figure. 2, the higher the engagement level, the darker the color displayed.

Figure. 1 is the graphic of student's engagement level for e-learning AI before the UI/UX design is applied. In general, from the data shown in Figure. 1, the majority of respondents stated "agree" and "neutral" for each statement that has been prepared in the questionnaire. And the number of respondents who stated "disagree" was quite a lot. Nearly 30% of respondents stated "disagree" for the Q6 statement which is one of the sub-indicators of skills, followed by the Q8 and Q3 statements which were about 15% each of the respondents. In addition, for the statements of Q10, Q6 and Q8 there were still respondents who stated "strongly disagree". From these data, it can be concluded that the level of learning engagement for the Q6 statement is quite low.

On the other hand, the highest number of respondents who stated "strongly agree" was for statements Q11, Q5 and then Q1 with each percentage not more than 16%. For the Q11 statement, although there were still respondents who stated disagree, no one stated strongly disagree. The majority stated "agree" and "neutral" for this statement. In contrast to the Q11 statement, for the Q5 and Q1 statements, neither "disgree" nor "strongly disagree". The majority of respondents stated "agree" and only a few stated "neutral".

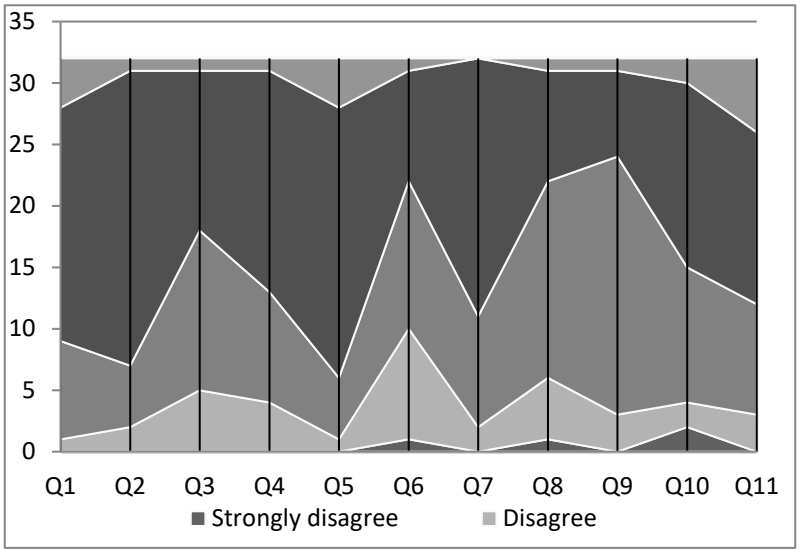

Figure 4. Proportion of Each Student's Engagement Level Before Applying UI/UX Design

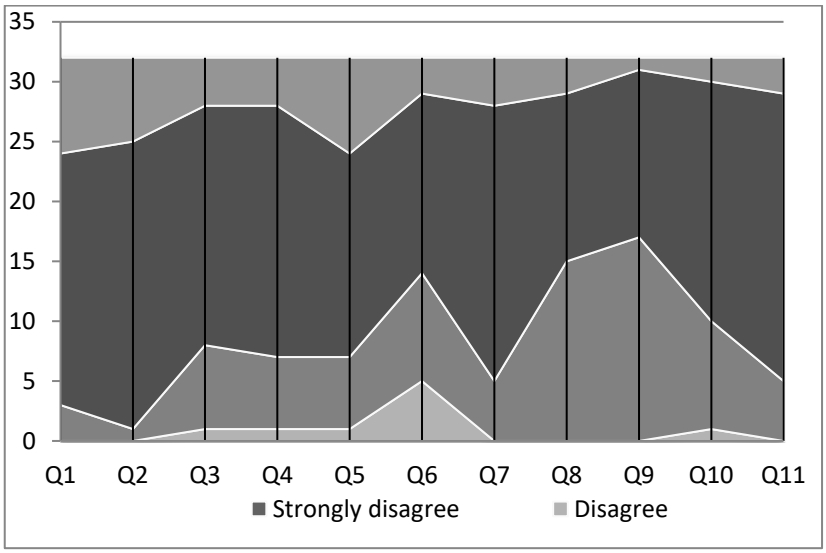

Figure 5. Proportion of Each Learning Engagement Level for After Applying UI/UX Design

Figure 2 is a student's engagement level graph for e-learning AI using the designed UI/UX. When compared with Figure 1, it can be seen that in Figure2 there are no respondents who stated Strongly Disagree for every question asked. In addition, the area that shows respondents disagree and neutral in Figure 2 is less than in Figure 1. On the other hand, the area that shows respondents agree and strongly agree in Figure 2 is wider than in Figure 1. This indicates that in general there is an increase in learning level. engagement in the learning process after the e-learning AI used to implement the designed UI/UX.

In more detail, the engagement level for each indicator is calculated based on the percentage obtained from the survey score using the Eq formula. 1. Table 2 is the result of calculating the engagement level generated using this formula.

$$Learning\ engagement\ (\%) = \frac{\sum_1^n scor}{\sum_1^n \max(scor)} \qquad \text{Equation 1}$$

Table 3. Percentage of Learning Engagement Level Before and After Applying UI/UX Design

Indicator	Question	Before applying UI/UX design (%)	After Applying UI/UX design (%)	Increasing of Learning Engagement (%)
Skills	Q1	76,25	83,75	9,84
	Q2	75	83,75	11,67
	Q3	67,5	76,875	13,89
	Q4	70	77,5	10,71
	Q5	78,125	80	2,40
	Q6	61,25	68,75	12,24
Emotional	Q7	71,875	80	11,30
	Q8	63,125	72,5	14,85
	Q9	63,75	70	9,80
	Q10	67,5	75,625	12,04
	Q11	73,75	79,375	7,63

From Table 2, it can be seen that the increased value of student's engagement for several statements reached more than 10%, namely statements Q8, Q3, Q6, Q10, Q2, Q7, and Q4. If the average increase for each indicator is calculated, it is found that the skills indicator has increased by 10.13% and the emotional indicator is 11.12%. The least significant increase occurred in the Q5 statement. The insignificant increase in the Q5 statement is most likely because the level of student's engagement for Q5 before implementing UI/UX is already quite large, namely 78.125%.

5. CONCLUSION

In this paper we evaluate the effect of UI/UX design on AI learning system for student's engagement. To evaluate it, we used two indicators from OSE matrix which is skills and emotional. In more detail, we used 6 statements for skills and 5 statements for emotional as sub-indicators. Evaluation process was carried out by comparing the result of OSE matrix for both of Al e-learning system without UI/UX design and Al e-learning system with UI/UX design. The analysis result shows that student's engagement of Al e-learning system with UI/UX design is higher than Al e-learning system without UI/UX design which is 10.13% for skill an 11.12% for emotional.

For the future research, we suggest to evaluate all indicators of OSE which are skill, emotional, participant and performance to get more comprehensive result.

6. SUGGESTED

The authors would to thanks to students and teachers in SMKN 11 Bandung and SMKN 1 Cimahi who support this research by providing facilities to conduct this research.

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