How Activity Focus Emotions Influence Cognitive Engagement in Asynchronous Learning

Putri Sukma Deri[1], Izzanil Hidayati[2], Silvi Juwita[3]

psukmaderi@fpk.unp.ac.id[1], izzanilhidayati@fpk.unp.ac.id[2], silvijuwita@fpk.unp.ac.id[3]

Universitas Negeri Padang, Padang, Indonesia[1,2,3]

Abstract. Asynchronous learning is a learning setting that is currently popular, especially to answer the needs of current developments and efforts to adapt to pandemic situations. On the other hand, learning in an asynchronous setting presents its own challenges. Not all students are able to remain engaged with the learning process when learning is carried out independently. Meanwhile, students need an in-depth learning process. Cognitive engagement is believed to be influenced by the emotional experiences one feels in the learning process. The aim of this research is to find out how activity focus emotion (enjoyment, anger and boredom) influences cognitive engagement in asynchronic learning. The multiple linear regression test carried out shows the results that the influence of activity focus emotion (enjoyment, anger and boredom) together can have a significant influence on cognitive engagement. The contribution made by emotions to engagement is 57%. Meanwhile, separately, only the emotion of enjoyment has a positive influence on cognitive engagement ($p < .001$). There was no significant influence of negative emotions (boredom and anger) on cognitive engagement in asynchronous learning.

Keywords: asynchronous, activity focus emotion, cognitive engagement

1. Introduction

As time goes by, there are many updates to media, methods, types and learning settings that can be used in the world of education. One of the learning settings that is currently widely used is asynchronous learning. This asynchronous setting has developed to answer the need for more effective, flexible and efficient learning after the challenges of the pandemic emerged [1]. Asynchronous setting is a learning setting that provides opportunities for students and lecturers to be in different places, allowing access to learning from anywhere [2]. In general, it can be seen that the setting will facilitate the learning process that will be carried out. On the other hand, not all students have a learning strategy, especially when they are required to study alone at home. Not all students are able to learn independently and always on track, maintain their motivation and have a high willingness to follow and achieve the learning goals that have been set [3].

Meanwhile, for university students themselves, the learning demands given are quite heavy compared to lower levels of education. For Indonesian students studied in this study, the regulation of the Minister of Education and Culture Regulation Number 3 of 2020 concerning the National Standards for Higher Education was applied. The regulation states that universities

ICoPHI 2024, November 02, Padang, West Sumatera, Indonesia

DOI 10.4108/eai.2-11-2024.2354559

must provide education that focuses on student-centered learning. With these demands, learning at university requires students to have the willingness or desire to carry out a deeper learning process. Theoretically, the willingness to follow the learning process is also called engagement [4]. Furthermore, involvement in a deeper learning process is also called cognitive engagement [5]. This cognitive engagement is the learning involvement needed by students in their learning activities. Students who are cognitively engaged will carry out deep learning, can regulate themselves [6]. According to Reeve [4], [7], this cognitive engagement is the use of deep learning strategies when participating in learning activities. In other words, students are able to create their own learning strategies, seek conceptual understanding compared to superficial knowledge, use planning in learning.

In general, engagement is important to have in learning. Skinner and Pitzer [8] said that there are three reasons that explain the importance of academic engagement. First, engagement is an important condition for students to learn. Only when students participate in academic activities physically and mentally can the time spent by students in class produce knowledge and skills. Second, engagement shapes students' daily experiences at school, both psychologically and socially. For example, high quality engagement and good learning outcomes will make students feel academically competent, and get more positive interactions, and support from teachers. Furthermore, students who are engaged will also find it easier to build friendships with classmates or peers who are also engaged. Third, engagement is an important contributor to students' academic development. Engagement is an important part of the academic resilience process and a source of energy that helps students cope with daily stressors, challenges, and setbacks in school more adaptively.

Another perspective of asynchronous learning, in the study [9] found that asynchronous communication is more useful for learning that requires discussion of complex ideas and in-depth discussions. In other words, basically asynchronous settings provide space for high cognitive engagement. However, this asynchronous setting is indeed not ideal for getting optimal learning performance when dealing with practical skills [10]. Online learning is specifically an effort to meet the unique needs of students in getting a better understanding of learning [11]. From several literature studies so far, it can be seen that there are positive and negative aspects of asynchronous settings on cognitive engagement. It needs to be explored further regarding factors that can increase cognitive engagement.

Pekrun through studies related to control value theory and several studies [12], [13], said that the emotional experience felt by students when studying will affect engagement including regulation (cognitive aspect). It was found that one of the things that can affect cognitive engagement is emotion [12], [14]. Emotions that are directly related to learning achievement activities or the results of learning achievements are also called achievement emotions [12], [14], [15]. The dimensions of achievement emotions that focus on learning activities are called activity focus emotions, which consist of enjoyment, boredom and anger [12], [14], [15].

From previous research conducted on students [16], a picture was obtained regarding the emotions felt by students when learning asynchronously, enjoyment was felt in the high category, anger was felt in the low category and boredom was felt in the medium to low category. The conclusion is, basically the emotions felt when learning asynchronously tend to be positive. However, in previous studies, researchers have not obtained a picture of how these emotions affect student engagement. Based on the study above, the purpose of this study is to see how activity focus emotions affect cognitive engagement when learning asynchronously.

2. Method

The research is a quantitative study using multiple linear regression analysis method with the help of JASP. In this study, what is measured is how the influence of activity focus emotions consisting of enjoyment, anger and boredom on cognitive engagement. In this study, cognitive engagement was measured using asynchronous learning settings. The subjects in this study were students of Padang State University with the characteristics of being active students, who had participated in asynchronous learning. For Padang State University, asynchronous learning refers to the use of e-learning in the learning process. Subjects are required to be in their second year with the assumption that students have felt the complete learning process in asynchronous settings. The sampling technique used for this study was purposive sampling. The sample that could be collected in this study was 505 students.

Data collection using previously tested measuring instruments. To measure enjoyment, anger and boredom, A Short Version of the Achievement Emotion Questionnaire (The AEQ-S) was used [17]. This measuring instrument was developed by Maik Bieleke, Reihard Pekrun, et al. in 2020. The number of items that will be used to measure the emotions of enjoyment, boredom and anger is 15 items. To measure cognitive engagement, self-regulated (metacognitive) learning was used, developed by Wolters in 2004 [7]. The reliability of the measuring instrument used is classified as good with a Cronbach Alpha value of more than 0.8. The following are the data from the reliability test results of the measuring instrument used in this study.

Table 1. Intrument's Reliabilities

Variable/ Dimention	Cronbach Alpha	Item Rest Correlation
Cognitive Engagement	0.905	0.703
		0.794
		0.799
		0.806
		0.710
Enjoyment	0.901	0.750
		0.786
		0.808
		0.782
		0.647
Anger	0.890	0.680
		0.798
		0.760
		0.653
		0.779
Boredom	0.903	0.734
		0.759
		0.717
		0.800
		0.783

3. Result and Discussion

3.1 Descriptive Results

The first result to be discussed in this study is descriptive data. This study uses a Likert scale of 1-5, so the average value of the measurement of all variables is at an average score of 3. Based on table 2, it is known that the cognitive engagement value is slightly above the average (Mean: 3.432, SD: 0.874). For activity focus emotion, it is known that the value of enjoyment is also above the average score of 3 (Mean: 3.469, SD: 0.984). While anger (Mean: 2.240, SD: 0.998) and boredom (Mean: 2.557, SD: 1.070) get relatively lower values.

Table 2. Descriptive Results

Variables	N	Mean	SD	SE
Cognitive Engagement	505	3.432	0.874	0.039
Enjoyment	505	3.469	0.894	0.040
Boredom	505	2.557	1.070	0.048
Anger	505	2.240	0.998	0.044

The descriptive values obtained indicate that University students are quite cognitively engaged in learning carried out in asynchronous settings. Students also quite enjoy learning carried out asynchronously. This finding is different from the findings of Stephan [18] who found that students who take online courses tend to have higher levels of boredom, anxiety, and anger, but less enjoyment.

The finding of quite high cognitive engagement can be explained through research [19] which shows that students who have experienced online learning will find it easier to regulate their learning by using certain strategies. He found a significant difference with students who have never experienced online learning before. A fairly high value in cognitive engagement in the subject means that students may be quite used to online learning so that they can be more cognitively engaged, such as creating learning strategies independently. This is also supported by the feeling of enjoyment felt by students in carrying out learning through e-learning media (asynchronous).

3.2 Inferential Results

In the inferential results section of this study, the results of the research hypothesis testing will be presented, namely testing the influence of activity focus emotion on cognitive engagement during asynchronous learning. However, before that, it is necessary to present the results of the assumption test before presenting the results of the multiple linear regression test.

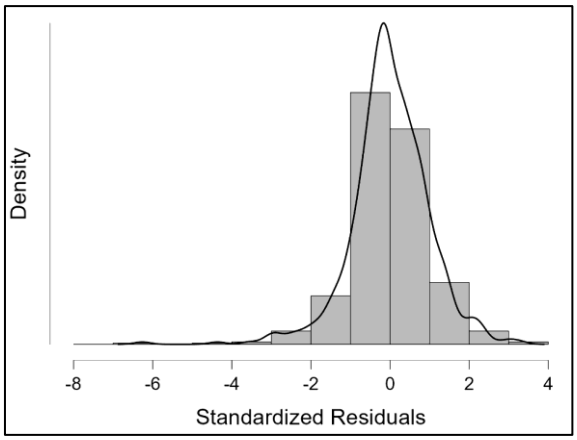

Fig 1. Data Distribution

Figure 1 shows that the data is spread close to 0, this means that the data from this study is normally distributed.

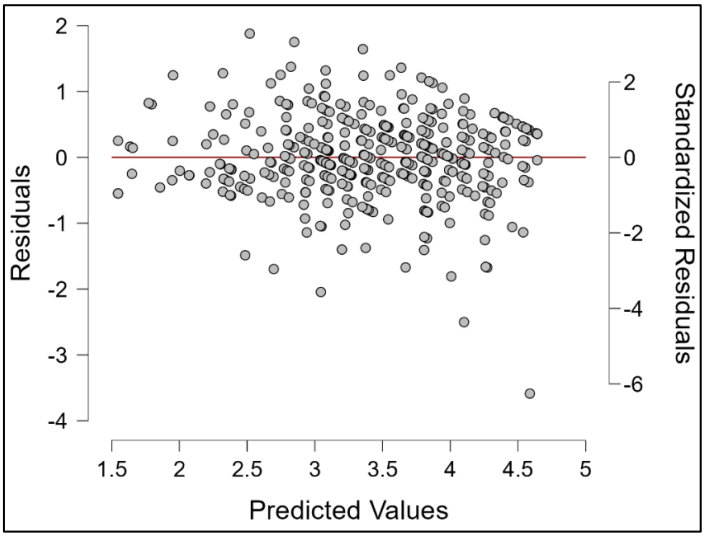

Fig 2. Homogenity Test

Figure 2 shows a sloping line, meaning that the homogeneity test is met, there is no residue influenced by other variables. As for multicollinearity, it can be seen in table 5. It is known that the VIF value of all variables is less than 10. then there is no multicollinearity.

Table 3. ANOVA

Model	Sum of Squares	df	Mean of Square	F	p
Regression	219.186	3	73.062	221.056	.0001
Residual	165.587	501	0.331		
Total	384.773	504			

Table 3 shows a p value < .001, this means that activity focus emotion has a significant effect on cognitive engagement. This significant value explains that the emotions of enjoyment, anger and boredom can simultaneously have an impact on students' cognitive learning engagement when participating in asynchronous learning.

Table 4. Model Summary – Cognitive Engagement

Model	R	Rsquare	Adjusted Rsquare	RMSE
H_0	0.000	0.000	0.000	0.874
H_1	0.755	0.570	0.567	0.575
Total	384.773	504		

In table 4, the R^2 value for H1 can be seen as 0.570. This means that the influence of activity focus emotion together on cognitive engagement is 57%, while the rest is influenced by other variables not measured in this study.

Table 5. Coefficients Significance and Multicollinearity

Model	Unstandardized	Standar error	Standardized	t	p	Collinearity statistic	
						tollerance	VIF
Enjoyment	0.747	0.030	0.764	24.738	0.001	0.900	1.111
Boredom	0.024	0.036	0.030	0.687	0.493	0.451	2.216
Anger	0.003	0.037	0.003	0.071	0.943	0.481	2.079

Separately, the influence of activity focus emotions can also be seen in table 5. Enjoyment has a significant positive influence on cognitive engagement with a p value of <.001. While the other two negatives do not have a significant influence on engagement with a p value of anger is 0.943 and a p value of boredom is 0.493.

The highlight of this study is the positive influence of enjoyment on cognitive engagement. This means that when students are happy and enjoy the asynchronous learning process, they will be more cognitively involved in the learning process. Students will actively create independent learning strategies to gain the understanding they need. They will take the initiative to carry out an in-depth learning process. Students will try to regulate themselves to achieve the learning goals that have been set.

Another research result that is in line with this research is research conducted by Anthony [20]. From the results of data collection that he conducted on 302 students, it was found that enjoyment as a positive activating emotion has a significant influence on students' desire to elaborate in learning and use their metacognition. In contrast to the findings of researchers who did not find the influence of negative emotions, Antony explained that boredom is a negative predictor of metacognition. Students who are bored with online learning may not develop adaptive learning strategies such as elaboration and metacognition. While enjoyment is positively correlated with students' tendency to use deep learning strategies, such as elaboration and metacognition [15], [21].

In general, Wu's [22] findings also support the results of this study. Wu said that positive achievement emotions, such as enjoyment, pride, and relaxation can encourage students' motivation, engagement, performance, satisfaction, and achievement in online learning. In line with the results of this study which showed no effect of negative emotions on engagement, Wu also said it was difficult to determine the effect of negative emotions on online learning outcomes.

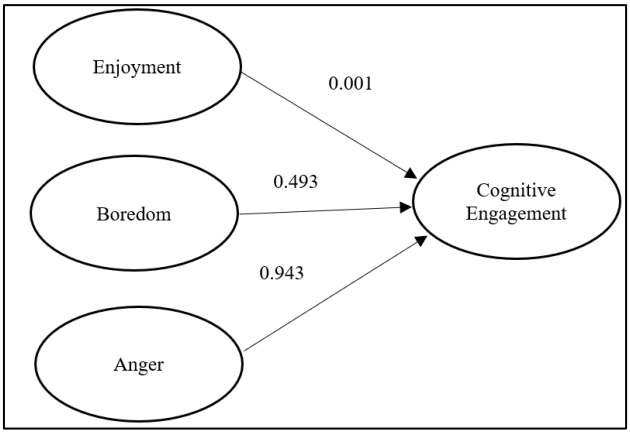

Fig 3. Activity Focus Emotion and Cognitive Engagement Regression Model

This study found that enjoyment and cognitive engagement in asynchronous learning settings were relatively high. This suggests that students may have had adequate online learning experience, so they tend to be more responsible for the learning process they are carrying out [11]. Another perspective from Wang [23] shows that enjoyment and boredom mediate the relationship between student and lecturer interactions with engagement. This means that students' emotions will be greatly influenced by the presence or absence of interaction between teachers and lecturers.

4 Conclusion

The emotions of enjoyment, anger and boredom which are theoretically called activity focus emotions have a significant influence on cognitive engagement when learning is carried out asynchronously. Together, the contribution given by activity focus emotions to engagement is 57%. On the other hand, separately, only the emotion of enjoyment has a positive influence on cognitive engagement and there is no significant influence given by negative emotions (anger and boredom). The habituation of the online learning process can be the reason for the relatively high enjoyment and engagement of students in the learning process carried out asynchronously.

Acknowledgments. The authors would like to thank Lembaga Penelitian dan Pengabdian Masyarakat Universitas Negeri Padang (LPPM UNP) for funding this work with a contract number: 1729/UN35.15/LT/2024.

References

[1] W. Bao, “COVID -19 and online teaching in higher education: A case study of Peking University,” Hum Behav Emerg Technol, vol. 2, no. 2, pp. 113–115, Apr. 2020, doi: 10.1002/hbe2.191.

[2] H. Xie, W. Liu, J. Bhairma, and E. Shim, “Analysis of synchronous and asynchronous E-learning environments,” Proceedings of the 2018 3rd Joint International Information , 2018.

[3] M. K. Hartnett, “Influences that undermine learners’ perceptions of autonomy, competence and relatedness in an online context,” Australasian Journal of Educational Technology, vol. 31, no. 1, Feb. 2015, doi: 10.14742/ajet.1526.

[4] Lee Woogul and Reeve Johnmarshall, “Teachers’ estimates of their students’ motivation and engagement: being in synch with students.,” Educ Psychol (Lond), vol. 32, no. 6, pp. 727–747, 2012.

[5] J. A. Fredricks, P. C. Blumenfeld, and A. H. Paris, “School Engagement: Potential of the Concept, State of the Evidence,” Rev Educ Res, vol. 74, no. 1, pp. 59–109, 2004, doi: 10.3102/00346543074001059.

[6] A. Barlow, S. Brown, B. Lutz, N. Pitterson, N. Hunsu, and O. Adesope, “Development of the student course cognitive engagement instrument (SCCEI) for college engineering courses,” Int J STEM Educ, vol. 7, no. 1, Dec. 2020, doi: 10.1186/s40594-020-00220-9.

[7] J. Reeve and W. Lee, “Students’ classroom engagement produces longitudinal changes in classroom motivation,” J Educ Psychol, vol. 106, no. 2, pp. 527–540, 2014, doi: 10.1037/a0034934.

[8] J. T. Guthrie, A. Wigfield, and W. You, Handbook of Research on Student Engagement. 2012. doi: 10.1007/978-1-4614-2018-7.

[9] S. Hrastinski, “How do e-learners participate in synchronous online discussions? Evolutionary and social psychological perspectives,” in Evolutionary Psychology and Information Systems Research., Boston: Springer, 2010, pp. 119–147.

[10] C. G. Ogbonna, N. E. Ibezim, and C. A. Obi, “Synchronous versus asynchronous e-learning in teaching word processing: An experimental approach,” S Afr J Educ, vol. 39, no. 2, pp. 1–15, May 2019, doi: 10.15700/saje.v39n2a1383.

[11] J. C. Richardson and T. Newby, “The Role of Students’ Cognitive Engagement in Online Learning,” American Journal of Distance Education, vol. 20, no. 1, pp. 23–37, Mar. 2006, doi: 10.1207/s15389286ajde2001_3.

[12] O. Schultz and R. Pekrun, Emotion in education. 2007.

[13] F. Malahati and F. H. Santhoso, “Peran emosi akademik terhadap prestasi akademik selama pembelajaran daring dengan regulasi diri dalam belajar sebagai mediator,” Universitas Gajah Mada, 2021.

[14] R. Pekrun and L. Linnenbrink-Garcia, “Academic emotions and student engagement,” in Handbook of Research on Student Engagement, Springer US, 2012, pp. 259–282. doi: 10.1007/978-1-4614-2018-7_12.

[15] R. Pekrun, Emotions and Learning. Belley, France: Gonnet Imprimeur, 2014. [Online]. Available: http://www.iaoed.org

[16] P. S. Deri, R. Rezki Elvika, I. Hidayati, and U. N. Padang, “Achievement Emotion: What Do Students Feel When Studying Online?,” 2024, doi: 10.4108/eai.4-11-2023.2344359.

[17] M. Bieleke, K. Gogol, T. Goetz, L. Daniels, and R. Pekrun, “The AEQ-S: A short version of the Achievement Emotions Questionnaire,” Contemp Educ Psychol, vol. 65, Apr. 2021, doi: 10.1016/j.cedpsych.2020.101940.

[18] M. Stephan, S. Markus, and M. Gläser-Zikuda, “Students’ achievement emotions and online learning in teacher education,” Front Educ (Lausanne), vol. 4, 2019, doi: 10.3389/feduc.2019.00109.

[19] J. C. Richardson and T. Newby, “The Role of Students’ Cognitive Engagement in Online Learning,” Int J Phytoremediation, vol. 21, no. 1, pp. 23–37, 2006, doi: 10.1207/s15389286ajde2001_3.

[20] A. R. Artino and K. D. Jones, “Exploring the complex relations between achievement emotions and self-regulated learning behaviors in online learning,” Internet and Higher Education, vol. 15, no. 3, pp. 170–175, Jun. 2012, doi: 10.1016/j.iheduc.2012.01.006.

[21] R. Pekrun and L. Linnenbrink-Garcia, “Academic emotions and student engagement,” in Handbook of Research on Student Engagement, Springer US, 2012, pp. 259–282. doi: 10.1007/978-1-4614-2018-7_12.
[22] R. Wu and Z. Yu, “Exploring the effects of achievement emotions on online learning outcomes: A systematic review,” Front Psychol, vol. 13, Sep. 2022, doi: 10.3389/fpsyg.2022.977931.
[23] Y. Wang, Y. Cao, S. Gong, Z. Wang, N. Li, and L. Ai, “Interaction and learning engagement in online learning: The mediating roles of online learning self-efficacy and academic emotions,” Learn Individ Differ, vol. 94, p. 102128, Feb. 2022, doi: 10.1016/j.lindif.2022.102128.