

EMOTIONAL ENGAGEMENT INDEX: A NOVEL TOOL TO MEASURE EMOTIONAL ENGAGEMENT IN BLENDED LEARNING

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ABSTRACT

Emotional engagement is one of the core elements for implementing impactful learning experience in education as well as professional training. This element however is often been reported through self-administered questionnaire or psychometric approach. That approach may not capable to represent the context of student's emotion in each session of the class. As a result, there is lack of indicator that measure this affective domain in consistent, simple and systematic manner. This study proposed a simple online attendance that include emotional icon or emoji as a graphical clue for students to indicate their feelings in the class during attendance signing process. The population or number of students in this study is 45. Student emotion data from each attended face-to-face session has been analyzed in formulating an emotional engagement index for each student in class. The index is a ration value from the frequency of the emotion against total class session in a semester. Based on the index, this study adopts a simple linear regression method and found that there is a positive relationship between emotion and the attainment of course learning outcomes with r = 0.4557 for the cognitive domain. The proposed emotional index formulated based on emoji data is a novel approach for educators to measure student emotional engagement in blended learning environment.

Keywords: Emotional engagement, emotional index, learning outcomes

INTRODUCTION

The Malaysia national education philosophy¹ states that;



"Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious, based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving high level of personal well-being as well as being able to contribute to the harmony and betterment of the family, the society and the nation at large."

The idea of emotion has been addressed in the national education policy. Generally, the emphasize is academic is more on the intellectual or cognitive capacity, either through education innovation adoption or conventional assessment system. However, there is a lack of practical and impactful approach to assess the emotional part of student well-being. Assuming student capable to learn effectively without considering the influence of emotional part would violate the national education philosophy. Therefore, the aim of this study is to investigate a practical approach in assessing student's emotional engagement in blended learning environment.

LITERATURE REVIEW

Student Engagement

In blended learning strategy, physical presence of both teacher and student is still required as defined² by the term itself. Blended learning can be easily understood as combination of face-to-face and online learning. There are claims that blended learning has an impact on student engagement³⁻⁶, academic performance⁷ and learning outcomes⁸. Implementation of blended learning is critical for higher education. According to Malaysia e-learning policy known as DEPAN 2.0⁹, certain percentage of the course offered by higher education institution should implement blended learning approach within three phases. With the success and effectiveness of flipped classroom¹⁰, the needs of strategic impactful student engagement in face-to-face is critical towards the culture of smart university^{11,12}. Student engagement can be conceptualized as integration of three interrelated dimensions which are cognitive engagement, emotional engagement and behavioral engagement. While there are many literatures on student engagement in online learning, there is limited research on student engagement in face-to-face approach. Therefore, the first research question in this study is:

RQ1: What is the differences in term of number of studies on student engagement in blended learning between face-to-face and online learning approach?

Emotional Engagement

Emotional engagement is a very interesting topic of research not only in education but also in business^{13–15}. In education, it is often been reported through self-administered questionnaire or psychometric approach. Previous study¹⁶ reported that this approach has its own limitation in presenting the context in accurate manner. This self-reported approach may not capable to represent the context of student's emotion in each session of the class, if it is been measured through typical survey approach. The use of emotional icon or emoticon¹⁷ in social media has been widely accepted by many people who use Internet. This suggest that emoticon or also called as emoji is a very practical medium to capture student's emotion in class instead of using psychometric instruments. Although measuring student's emotion through psychometric



instrument is an old and widely adopted practice by researchers, it is not practical to be used to measure in contextual and high frequent event like class session. Based on limitation of psychometrics-based instrument, we found from the literature ¹⁸ the potential used of emotional icon or emoji. Recent study ¹⁹ claims that emoji should be integrated in educational communication due to its potential to enhance social-constructivist pedagogy. Inspired by the studies ^{20–22} revealing the advantages of emoji as visual communication, we adopt emoji one of the components in our instrument. The use of emoji may resolve the way how the data can be captured effectively, but what new insights this emoji data can offer in pedagogy domain. Therefore, the second research question of this study is:

RQ2: Is there any relationship between student emotional engagement with course learning outcomes attainment?

Student Attendance System

The best teaching and learning context to measure student engagement is during face-toface session. This is justified with literature²³ that claim face-to-face or in class activities comes with "more engagement" and "immediate feedback" which are foundation for student to progress in learning. But measurement and statistical methodologies are yet another challenges highlighted by Fredricks and his team²⁴ regarding student engagement. Since face-to-face learning approach is part of blended learning, generally student attendance or absence is a very practical indicator in assessing student engagement²⁵ and academic performance²⁶. The student attendance can be used as a direct representation of student behaviour engagement in the course. Conventional student attendance only capture student identify either student's signature or the instructor writes a note by calling student's name in the class, which is not productive nor smart. There are many studies on student attendance system that integrate biometrics²⁷, Quick Response or QR code²⁸, Radio Frequency Identification (RFID)^{29,30} and voice recognition ³¹. Most of the study is focusing on the technological aspect and less emphasize on the student engagement particularly emotional engagement. With more online services offered through cloud computing technology, there is a promising opportunity how this matured and global scale adopted technology can be used to create a simple and smart attendance system that incorporate components of emotional engagement. Our third research question of this study is:

RQ3: What is the model of attendance system that incorporate emotional engagement data?

Based on critical needs of student emotional engagement in class, the potential of emoji and student attendance system, this study integrates these three components in order to measure student emotional engagement effectively and contextual manner for blended learning environment. Therefore, the aim of this study is to formulate and test an emotional engagement index in measuring student emotional engagement in blended learning environment in face-to-face session.





METHODOLOGY

Participants and Procedure

The data were collected from the students who enrolled in a course conducted by the author that been offered at Semester 2 in 2018/2019 session. Table 1 indicates the profile of the target population.

Table 1. Participants of study

Student Size 46 (Male:20; Female:26)

Enrolment duration 28 Jan 2019 – 26 May 2019

Number of week 14 weeks

Number of lecture session 1 session per week (2 hours)

Number of laboratory session 1 session per week (2 hours)

Total face-to-face session for student 28 sessions

Course Learning Outcomes CO1 Analyze the concept of data

analytics and visualization in various applications (Cognitive

domain)

CO2 Construct a visualization application

by implementing data analytics and

visualization techniques.

CO3 Shows the ability for independence

learning and propose the suitable solutions to facilitate stakeholder

decision making.

The procedure adopted in this study for data collection are based on quantitative method. We collect student emotion data by using cloud-based smart attendance system which include emotional icon or emoticon every class or laboratory session. Figure 1 shows the process flow of the data collection procedure.



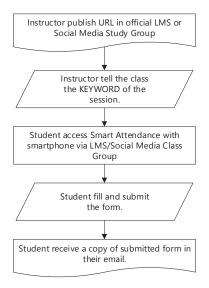


Figure 1. Data Collection Procedure

Instrument

Instruments used in this study in order to answer the research questions are summarized in Table 2.

Table 2. Instruments adopted in study

Research question	Instrument
RQ1	Harzing's Publish or Perish software tool
RQ2	Emotional Engagement Index
RQ3	Cloud-based Smart Attendance

The formulation of the emotional engagement index is based on the following calculation model: -

$$E = \frac{\sum (emoji \times Emoji \, scale)}{maximum \, class \, session} \tag{1}$$

The emotion scale used to represent the the degree of positive engagement is illustrated in Table 3.

Table 3. Emoji scale





Emoji	Emotion description	Scale
	Student feel great with the class learning experience.	4
<u>•</u> •	Student feel ordinary with the class learning experience.	3
© ©	Student feel unknown with the class learning experience.	2
977000	Student feel bad with the class learning experience.	1

We designed a simple online form on the cloud services which used as student attendance form as our instrument in this study. There are items of emotion which represented by emoji. In each class or laboratory session, student needs to fill the form by using their smartphone or computer as a replacement on manual attendance taking process. Figure 2 shows the visual model of the instrument used in this study.

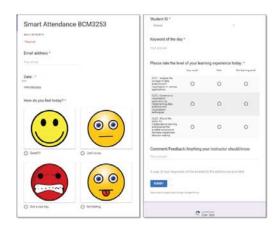


Figure 2 Visual Model of the Attendance Form used as Instrument

MAIN RESULTS

Result 1: Research Gap Analysis of Student Engagement in Blended Learning

Table 4 shows our initial findings from Google Scholars database on the lack of studies on student engagement in face-to-face approach. To acquire this data, we used *Harzing's Publish or Perish* software tool to retrieve metadata of academic publications. Although face-to-face is older than online learning approach in education, the difference values of the *Year First* indexed is



seven years later than the online learning is quite surprising. This result shows that there is a big gap in research on student engagement between face-to-face and online learning. Although online learning approach compliment the limitation of face-to-face approach, a complete student engagement in term of cognitive, emotional and behaviour best to happen during face-to-face learning session. This gap suggests our study has potential contribution to the research on blended learning.

Table 4. Research gap on student engagement in blended learning

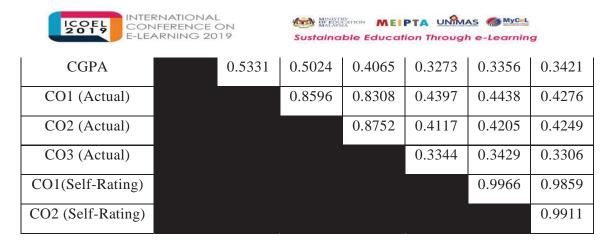
Query	student engagement ''face- to-face'' [title]	student engagement "online learning" [title]	Difference
Papers	16	144	128
Citations	28	2581	2553
Year First	2007	2000	7
Year Last	2019	2019	0
Years	12	19	7
Cites per Year	2.33	135.84	133.51
Cites per Paper	1.75	17.92	16.17
Cites per Author	10	1263.05	1253.05
Query Date & Time	7/13/2019 13:25	7/13/2019 13:36	-

Result 2: Relationship of Emotional Engagement with Course Learning Outcomes Attainment

In order to investigate the relationship of emotional engagement with the course learning outcomes attainment in RQ2, we adopt a simple linear regression to find the value of Pearson correlation coefficient (PCC). The emotional engagement index is then calculated based on the equation (1). Table 5 shows the result of analysis between previous CGPA, emotional engagement index, course learning outcomes attainment from assessment and perceived attainment from rating scale parameters.

Table 5. PPC value of Emotional Engagement with Course Learning Outcomes

		Actual			Self-Rating		
Parameters	CGPA	CO1	CO2	CO3	CO1	CO2	CO3
Emotional Engagement	0.3950	0.4557	0.4364	0.3577	0.9669	0.9642	0.9554



Based on the Table 5, there is strong positive correlation between student emotional engagement with the all course learning outcomes in the self-rating category. This indicates student emotional engagement highly influence their contextual perception on the attainment of the learning outcomes during the class or face-to-face session. This novel approach in measuring emotional engagement in context is the first time been reported through this study. Despite weak positive correlation on actual course learning outcomes attainment, this result indicates that student emotional engagement is significance on the actual attainment of learning outcomes. This is justified with the calculated probability or p-values shown in Table 6. In this case, we adopt the common value of α which is 0.05.

Table 6. Significance of Emotional Engagement with Course Learning Outcomes

	Emotional Engagement Index						
		Actual			Self-Rating		
	CGPA	CO1	CO2	CO3	CO1	CO2	CO3
Pearson Coefficient	0.3950	0.4557	0.4364	0.3577	0.9669	0.9642	0.9554
n	45	45	45	45	45	45	45
<i>p</i> -value	0.0072	0.0017	0.0027	0.0159	0.0000	0.0000	0.0000
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: $\alpha = 0.05$

DISCUSSION

Finding #1

RQ1: What is the differences in term of number of studies on student engagement in blended learning between face-to-face and online learning approach?

Based on the results in Table 4, there is an interesting research publication pattern in on student engagement between face-to-face and online learning approach. There are more research studies on online learning as compare to face-to-face approach. This perhaps due to limitation of effective data



acquisition method comparing to online learning and this will influence the duration and motivation of conducting study. The difference in term of number of studies on student engagement in face-to-face and online learning is not that critical as we consider the number of publication years for both cases. However, the number of total citations shows a big difference of study in student engagement in face-to-face and online learning. This interesting citation pattern might be the reason why study on student engagement in face-to-face has little attention by the researchers as compare to online learning. Citation has a direct impact on the calculation of h-index, a metrics in measuring the productivity of researchers³². This obvious research gap can be minimized with our model of smart attendance to effectively gathering data on student engagement in face-to-face approach.

Findings #2

RQ2: Is there any relationship between student emotional engagement with course learning outcomes attainment?

There is positive relationship between student emotional engagement with the course learning outcomes attainment. Table 5 shows the learning outcomes attainment from the self-rating has high positive correlation on student learning outcomes. Although the self-rating indicates student perception during the class session and it is not a formal assessment, perception also play an important part in student learning by promoting cognitive engagement of student with the course. This self-rating also important as a feedback for the instructor to improvise his teaching practice and verify the impact of the conducted teaching approach. For the actual course learning outcomes attainment through course assessments, there is weak positive correlation with emotional engagement. The overall score of course assessment is measured at the end of the semester might not be in close context for the emotional engagement. Although course assessment has better validity as compare to self-rating approach, the emotional engagement during learning process is best measured in context as emotion³³ itself is fluctuate over the time. Perhaps this is an explanation why the actual course learning outcomes attainment measured with course assessment has lower correlation values comparing to self-rating approach. This study might offer a key information on how emotional engagement can be and should be measured in contextual manner.

Findings #3

RQ3: What is the model of attendance system that incorporate emotional engagement data?

This study adopted emoji-based attendance system to incorporate emotional engagement data. Designed in cloud-based environment which accessible through smartphone, the acquiring emotional engagement data can be simplified and co-functioning or embedded in attendance taking process. Emotional data is difficult to acquire and some study on emotion require some dedicated and special sensors^{34,35}. The model of attendance system is simple and practical since it is deployed in cloud infrastructure using Google cloud service (Google Forms and Google Sheet). Unlike other emotion-



based data acquisition system, our attendance system does not require any additional hardware infrastructure and complex software configuration. Perhaps our model optimally the usage of campus Internet access and student digital devices. Therefore, our model of emoji-based attendance system has potential research contribution for facilitating educator and researcher conducting study on student engagement in face-to-face and blended learning environment.

CONCLUSION

Student emotional engagement index in blended learning approach particularly in face-to-face has a potential impact on student learning outcomes. Impactful learning experience should be measured in contextual manner especially on emotional engagement. Without proper and effective measurement strategy, how institution can manage student emotional engagement when it is not measured. With emoji-based attendance system, collecting student emotional data within attendance taking process can be adopted in consistent, simple and systematic manner while offer a new insight of attendance data. More contextual analysis can be made on student emotional engagement with emotional engagement index. The index formulated based on emoji data is a novel approach for educators to measure student emotional engagement in blended learning environment.

For future research, sentiment analysis can be adopted to perform text analysis in the reflection or comments by students. It then can be further associate with contextual emotion and overall emotional engagement index of student learning experience in blended learning environment.

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