Investigating Learner Emotional Engagement in Synchronous Online Learning

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Abstract: *Emotional engagement is highly important in synchronous online learning (SOL). However, few studies have investigated what learning activities can emotionally engage online learners. This study was conducted in a course with 16 graduate learners. The instructor deliberately designed some learning activities/events. The study aimed to investigate if these activities/events could emotionally engage the learners. Morphcast was used to analyze the learners' emotions in the Zoom session. Results showed that a well-prepared introduction, artifact sharing, taking a break, and giving peer feedback could emotionally engage online learners. However, the learners showed negative emotions in the ending period. Implications for teachers to design engaging lessons are discussed.*

Keywords: Synchronous online learning, Emotional engagement, Facial emotion recognition, Online learning

1. Introduction

Synchronous online learning (SOL) was highly effective during the pandemic (Wang et al., 2023). Its flexibility allows instructors to teach virtually in real-time, overcoming the challenges of transactional distance and enabling students to participate in geographically diverse locations. However, online students often have lower engagement than those in the physical classroom settings (Wang et al., 2023). Among the dimensions of cognitive, behavioral, and emotional engagement (Martin & Borup, 2022), emotional engagement appears most crucial for online learning, as students may quickly become bored or frustrated when they lack social support (Dewaele et al., 2022). Additionally, research suggests that emotional engagement has greater effects on learner outcomes than other types of engagement (Deng, 2021). Therefore, the purpose of this study was to investigate what learning activities can emotionally engage online students in SOL. The research question of this study aimed to answer is: What instructional activities/events can emotionally engage online learners in SOL?

2. Emotional Engagement and Learning Activities

Emotional engagement refers to students' emotional reactions to their academic pursuits (Martin & Borup, 2022). Scholars typically classify emotions into positive, negative, and neutral categories (Martin & Borup, 2022). Positive emotions, such as happiness, are often correlated with better learning outcomes. Negative emotions often hinder learning. However, certain neutral emotions, like confusion, which can either be positive or negative, may also be useful for learning (Halverson & Graham, 2019).

Pekrun et al. (2023) highlighted the significance of arousal, valence (positivity), and objects of interest for emotional engagement. An object of interest refers to any activity associated with a relevant emotion. Some typical learning activities and events in SOL include instructor-led presentations, autonomous learning, collaborative learning, and structured breaks (Prayogo et al., 2024).

Instructor-led presentations are common in lectures. Exemplary instructors leverage on positive emotions and minimize negative emotions to capture students' attention (Martin & Borup, 2022). Likewise, investing in autonomous learning activities, such as artifact development, enhances emotional engagement. Positive emotions emerge when learners take ownership of their education. Their confidence increases as they receive guidance and refine their work through feedback (Prayogo et al., 2024). Furthermore, collaborative learning can deepen emotional engagement as

learners foster camaraderie and friendly competition with peers (Volet et al., 2019). Moreover, taking breaks during learning helps alleviate negative emotions, which supports knowledge retention.

3. Methodology

This study was conducted in a course at the National Institute of Education, Singapore, where 13 Masters of Education and 3 Doctorate candidates were enrolled. One of the course assignments was a group assignment that required students to develop a 1 hour e-learning package in groups of four. Learners presented their theoretical framework and showcased their prototypes in a SOL session, where student emotional engagement was monitored using a facial emotion recognition analysis (FERA) tool: Morphacst.

Morphcast is an FERA tool utilized for monitoring student emotional engagement. Its web-based version could analyze a student's expressions during each minute of a Zoom meeting. Attention, arousal, and positivity were measured. Seven basic emotions (i.e., happiness, surprise, neutrality, disgust, fear, anger, and sadness) were analyzed. Additionally, four quadrants were used to characterize learners' valence and arousal. The operational description of each metric is presented in Table 1.

Table 1. Operation definitions of Morphcast metrics (adopted from Zignego et al., 2023)

Metric		Description
Student engagement	Attention	Indicates the level of focus students have on the content
	Arousal	Measure the intensity of emotional responsiveness
	Positivity	Measure the degree of positive response
Basic emotions	Happiness, surprise, neutrality, disgust, fear, anger, and sadness	Measure the degree of seven basic emotions as a percentage
Polar quadrant	High control	Measure student level of control during interaction flow.
	Low control	Measure a lesser degree of student control.
	Conductive	Represents behaviours that facilitate smooth interaction.
	Obstructive	Assesses behaviours that hinder the interaction process.

With regard to the study's learning activities/ events that were conducted during the last session of the course using Zoom, the instructor began the session with an *introduction*, where he implemented strategies such as a warm welcome, breaking the ice, and positive encouragement. Each group was then required to present two components of their work: *theoretical framework* and *artifact sharing*. In the middle of the session, a 15-minute *break* was provided. Also, *technical issues* were experienced by presenters during certain time periods. Nevertheless, after each group's presentation, students were invited to provide *peer feedback* using an online sheet. At the end of the session, the instructor also held a *debriefing* and offered feedback to the learners.

4. Results

Morphcast results are presented in the Appendix. The descriptive data were collected from the students, and these were then averaged to produce a mean score for each metric. The students were most attentive (=68.34%) and happy (=13.58%) during the instructor's introduction. A comparison between artifact sharing and theory presentation also showed that students appeared more attentive (=66.40% vs. 64.95%), less positive (=53.7% vs. 55.51%), and had lower control (=67.56% vs. 64.95%) during artifact sharing. Furthermore, Figure 1 illustrates increased arousal (in blue) and increased frustration (in green) when three PhD students presented their artifacts. During break time, learners demonstrated the highest arousal (=39.42%) and the lowest neutral scores (=19.55%). Learners were also the least angry (=11.98%) and most surprised (=18.15%) when facing technical issues. Additionally, during peer feedback, students appeared most positive (=57.73%) and displayed the highest control (=6.10%). Moreover, learner engagement was the lowest (arousal = 33.85% & attention = 60.15%), while negative emotions, including anger (=14.38%) and sadness (=20.64%), were the highest during the debriefing phase.

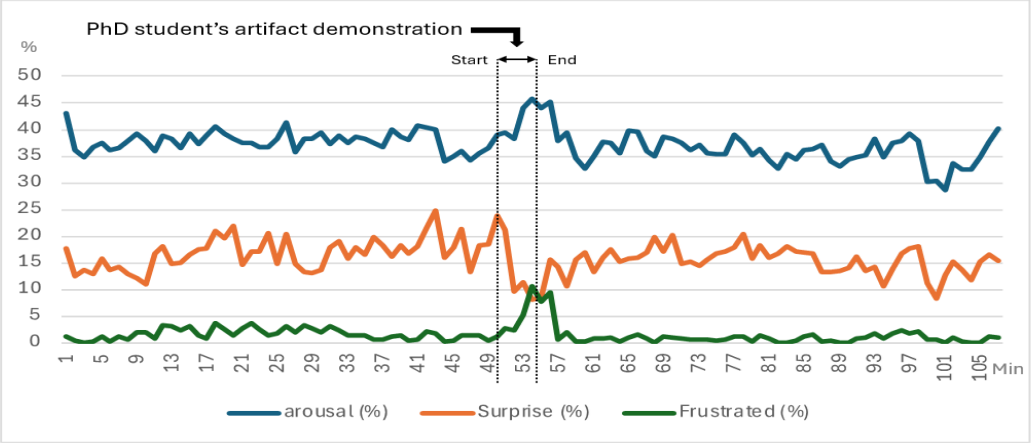

Fig.1 Time period when PhD students presented their

5. Discussion and Conclusion

Learners were most attentive and happy during the introduction. This suggest that students are most receptive during the period. Therefore, this is a good time for teachers to establish ground rules, make important announcements, and establish a positive relationship with learners. The study also revealed that, unlike theory presentation, learners were more attentive but less confident during artifact sharing. This may stem from their desire to see how their peers have performed (Jansen et al., 2022). Learners felt less confident when others did better, as evidenced by the increase in arousal and frustration when the PhD students presented their artifacts. Nevertheless, the surge in negative emotion has the potential to enhance learning as students strive for improved outcomes.

Students were more expressive during the break, as their arousal was the highest and neutrality lowest. Implementing such breaks can reduce negative feelings in a class (Prayogo et al., 2024). Also, students were not angry but rather surprised by technical faults. This finding was inconsistent with the result of Federman (2019). Additionally, students appeared most confident and in control during peer feedback. The increased autonomy may be attributed to students assuming the role of assessors to evaluate their peers (Prayogo et al., 2024). Student engagement was lowest during the debriefing phase, where negative emotions such as anger and sadness were detected. This finding implies that teachers should not use this period to convey important information.

In conclusion, a well-prepared introduction, artifact sharing, having a time break, giving peer feedback, and solving technical issues could increase learners' emotional engagement. However, learners showed negative emotions in the ending period.

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Appendix: Student engagement data during different learning activities

Metrics \ Learning Tasks		Introduction	Theory explanation	Artifact sharing	Break	Technical issues	Peer feedback	Debriefing
Student engagement	Arousal (%)	37.38	37.14	37.29	39.42	37.43	37.76	33.85
	Attention (%)	68.34	64.95	66.40	60.52	64.15	62.34	60.15
	Positivity (%)	54.98	55.51	53.70	49.72	55.80	57.73	56.27
Basic emotions	Angry (%)	13.12	12.50	12.16	12.24	11.98	13.46	14.38
	Disgust (%)	7.68	9.72	10.20	18.04	10.28	10.00	8.00
	Fear (%)	5.93	6.93	7.37	8.24	7.04	7.61	5.30
	Happy (%)	13.58	10.43	10.76	12.10	11.07	13.47	13.33
	Neutral (%)	25.76	26.35	26.51	19.55	24.01	24.42	24.64
	Sad (%)	19.78	17.59	16.14	16.65	17.62	15.71	20.64
	Surprise (%)	14.37	16.47	17.01	13.44	18.15	15.54	13.86
Polar quadrant	Conductive (%)	17.11	18.64	17.88	13.35	19.37	19.38	22.52
	High_Control (%)	4.27	3.82	3.24	2.16	3.96	6.10	2.31
	Low_Control (%)	68.67	64.95	67.56	62.55	64.08	62.01	69.25
	Obstructive (%)	9.95	12.40	11.32	21.94	12.59	12.51	5.92