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EFL Students' Emotional Reactions to Class Leaderboards



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Abstract

This article presents a study examining the emotional responses of English as a foreign language (EFL) students towards online class leaderboards. A mixed methods research design was employed to answer three research questions that aimed to determine the emotions students felt when they saw their leaderboard ranking online, the reasons why they felt those emotions, and the relationship between choosing an emotion and performance in the following week. The 14-week study occurred at a Japanese university with 26 EFL students. The results of the study showed that the positive emotions *determined* and *enjoyment* were noticeably more frequently chosen than any of the other emotions. The positive emotions *enjoyment*, *determined*, *pride*, and *hope* were more frequently reported for high and middle leaderboard ranked participants, and the negative emotions *shame*, *hopelessness*, and *anxiety* were more frequently reported for low leaderboard ranked participants. The most common reasons for choosing each emotion were also determined. Correlations were found between choosing a positive emotion and attaining a maximum score in the following week and choosing a negative emotion and not attaining a maximum score in the following week.

Keywords: Leaderboard; emotions; gamification; EFL; motivation.

Introduction

Gamification is the concept of applying game components and game mechanics to non-game situations to encourage specific behaviour to occur (Sheldon, 2011). It has been used in a wide range of situations to bridge the gap between desired behaviour and current behaviour. For example, most fitness apps

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(e.g., Nike Run Club) use numerous gamification components such as awards, streaks, and leaderboards to motivate users to achieve their fitness goals. The body of research that examines gamification is growing (e.g., Alam et al., 2023; Ekici, 2021; Reinhardt, 2019) and shows a range of positive and negative outcome effects (e.g., Koivisto & Hamari, 2019; Zhang & Hasim, 2023). However, researchers (e.g., Barata et al., 2017; Ekici, 2021) are still calling for further research that isolates specific gamification components in specific situations to better understand the most effective ways to incorporate gamification into learning experiences.

There is a plethora of gamification components and mechanics that could be individually utilised, or combined with each other, to attempt to achieve a goal of a gamified system (Chou, 2015; Kapp, 2012). There is concurrently ongoing concern and optimism about how certain gamification configurations impact student motivation and performance (e.g., Dehghanzadeh et al., 2019; Philpott & Son, 2022b). This study focuses on one gamification component, a leaderboard. The study is an extension of Philpott and Son (2022a), which showed that a leaderboard is an extrinsically motivating tool that encourages students to complete all their homework up to the reward threshold, but, once they had done enough work to achieve maximum points, they ceased work. The study was conducted in an English as a foreign language (EFL) context with a focus on the emotions students felt when they saw their leaderboard ranking online, the reasons why they felt those emotions, and the relationship between emotion and performance.

Literature Review

A leaderboard is a frequently used gamification component that can elucidate and motivate desired student behaviour (Philpott & Son, 2022a; Pi et al., 2024). Leaderboards are interconnected with multiple gamification components (e.g., points, rank), mechanics (e.g., feedback, competition), and dynamics (e.g., motivation, emotions, performance) (Werbach & Hunter, 2020). Leaderboards aim to encourage desired behaviour by rewarding compliancy with points and a favourable ranking and discourage non-desirable behaviour by the public display of a non-favourable ranking (Philpott & Son, 2022a).

In educational contexts, leaderboards have led to positive increases related to student engagement (e.g., Barata et al., 2017; Philpott & Son, 2022a; Pi et al., 2024), performance (e.g., Bai et al., 2020; Landers et al., 2019; Pi et al., 2024), time-on-task (e.g., Landers & Landers, 2014), and amount of work completed (e.g., Hew et al., 2016; Legaki et al., 2020). Leaderboards achieved these positive results by making students more aware of the course structure, providing clear goals and feedback, and influencing behaviour through social comparison (Aldemir et al., 2018; Domínguez et al., 2013; Tan & Hew, 2016). However, there is concern that leaderboards cannot sustain long-term engagement (e.g., Bai et al., 2020), negatively impact learning, (e.g., Diefenbach & Müssig, 2019; Hanus & Fox, 2015), are only beneficial for high performing students that like competition but detrimental to low performing students (Bai et al., 2021; Philpott, 2015), and undermine intrinsic motivation (e.g., Philpott & Son, 2022a). Variables such as personality type (e.g., Codish & Ravid, 2014), motivation (e.g., Heeter et al., 2011; Hew et al., 2016; Tan & Hew, 2016), leaderboard rank (e.g., Aldemir et al., 2018), difficulty of competition (e.g., Cao et al., 2022), and various social factors (e.g., Bursztyn & Jensen, 2015) will affect how leaderboards impact different students (Cheong et al., 2013; Domínguez et al., 2013; DuBravac, 2012; Jia et al., 2017).

In the second/foreign language (L2/FL) context, leaderboard systems are increasingly embedded into digital platforms such as Duolingo, English Central, and Memrise. These platforms use leaderboards to drive engagement, encourage consistency, and promote competitive motivation among

learners (Li et al., 2024). While studies have shown that gamification in language learning can improve motivation and learning outcomes (e.g., Reinhardt, 2019), the specific emotional responses that leaderboard rankings evoke in language learners remain underexplored. Because language learning often involves challenges like anxiety and low confidence (Alamer et al., 2021; Alharbi, 2021), it is important to understand how leaderboards affect students' emotions in L2/FL settings to design effective gamified activities.

Additional research is necessary to determine how leaderboards can be leveraged for maximum student benefit. In an academic context, students' emotions can impact their performance, learning, personal growth, and motivation (Zeidner, 1998). Therefore, examining the relationship between leaderboards and students' emotional reactions could provide insight into important topics such as engagement and disengagement (Pekrun et al., 2007). However, as emotions impact people differently, and as they are not experienced discretely, understanding their downstream effects on student behaviour can be difficult (Izard, 1991).

Pekrun et al.'s (2007) control-value theory of achievement emotions provides a framework for understanding the outcome effect of specific emotions. The control-value theory of achievement emotions considers three aspects of achievement emotions. First, the object focus is concerned with whether the emotion derived from doing the activity (activity-related) or the outcome of doing the activity (outcome-related). As a leaderboard presents the results of doing an activity, the object focus would be considered outcome-related. Second, emotions are classified as being positive or negative in their valence. Third, the activation direction considers whether an emotion leads to activated or deactivated behaviour. Negative emotions do not necessarily lead to deactivated behaviour and positive emotions do not necessarily lead to activated behaviour (e.g., Dewaele et al., 2022). For example, if someone looked at a leaderboard and saw their high ranking, they might feel pride and then motivated to work hard to sustain the feeling, or they might stop working hard because they achieved the goal. Other aspects of the control-value theory of achievement emotions that could be considered are whether a student feels autonomy when doing an activity, how relevant the activity is to a student, physiological and genetic traits, personal history, and the intensity of the emotions.

The competitive aspect of gamified systems will lead to a range of emotions based on how students conceptualise their successes and failures (Dominguez et al., 2013). For example, students who perform well on a leaderboard are likely to feel positive emotions, whereas students who perform poorly are likely to feel negative emotions (e.g., Cao et al., 2022; Cheong et al., 2013; Philpott, 2015). However, that is not always the case as Bursztyrn and Jensen (2015) discovered that some students who appeared at the top of a leaderboard felt embarrassed, and in turn, they lessened their work output to avoid that feeling. The competitive and comparative aspects of leaderboards are likely to lead to negative feelings for some students (e.g., Barata et al., 2013; Charles et al., 2011; Domínguez et al., 2013; Nicholson, 2013). Even though Aldemir et al. (2018) found that short deadlines can lead to distress for students, they did not consider the impact the negative emotion had on performance. Research that explores students' emotional reactions to leaderboards is lacking and needed to better understand the use of gamification and leaderboards in L2/FL education.

Building upon the literature review presented above, this study seeks to answer the following research questions in a Japanese EFL context.

1. What emotions do students feel when they look at their leaderboard rank?
2. Why do students feel those emotions?
3. What is the relationship between emotion and performance?

Regarding the third research question, “performance” refers to the amount of work completed in the week following the reported emotional response, not the performance that led to the emotion. In this study, “performance” refers specifically to weekly task completion outcomes rather than broader academic achievement.

Method

This study employed an explanatory sequential mixed-methods research design (Creswell, 2015). It was explanatory sequential because it first collected and analysed quantitative data in isolation, and then qualitative data was collected and analysed to provide confirmation and rich accounts of the quantitative data. The study had four main stages: Stage 1 – Preparation (e.g., student explanation handouts, leaderboards, research tools); Stage 2 – Data collection; Stage 3 – Data analysis; and Stage 4 – Answering research questions.

Participants

The study was conducted at a private university in Japan. The 26 participants (F = 14, M = 12) came from one intact Intensive English class that met three-times a week for 90-minute classes. Intensive English is a two-semester course. The study occurred in the second semester of the course. The first author of this article was the teacher for both semesters of the course. The participants were second-year students, aged 19–20 years old. Their TOEIC Listening & Reading scores were between 575 and 625 at the beginning of the first semester of the Intensive English course. They came from various academic departments at the university including law, business, and humanities. For the Japanese context, it is important to note that learners may be particularly sensitive to public ranking and social comparison due to cultural values that emphasise group harmony and the avoidance of embarrassment. As Yashima (2002) highlights, such sociocultural dynamics can significantly influence EFL learners' motivation, self-perception, and emotional responses in classroom environments.

Materials

The design of the Intensive English language course for this study was structured around three core elements: (1) the gamification components; (2) the homework; and (3) the ecosystem that linked everything together. While leaderboards and quests (weekly tasks designed to guide students through a learning experience) were the two main gamification components used in the study, this article focuses only on leaderboards. Limited point, absolute, public leaderboards were used to motivate the participants to complete all three components of their weekly homework: (1) a quest; (2) extensive reading using MReader (<http://mreader.org>); and (3) English Central (<https://www.englishcentral.com>). The teacher had access to each participant's quest, English Central, and MReader performance data. The three learning activities were purposely incorporated as together they targeted and supported a broad foundation of second language acquisition and foreign language motivation theories (e.g., Ellis, 2003; Krashen, 2009; Ryan & Deci, 2000; Swain, 2000).

Figure 1 shows the point scoring table that determined how many points a participant would receive each week. The 50/30/20 weighting was based on the relative emphasis placed on each component in the course. The maximum weekly points a participant could receive was 100. Two public leaderboards were created based on the number of weekly points received. A weekly leaderboard displayed and ranked how many points each participant received each week. An overall leaderboard displayed and ranked how many points each participant had accumulated since Week 1. Figure 1 also shows the deadline times for each activity. The deadline times vary due to limitations of the English Central and MReader websites.

A digital ecosystem was created for the specific requirements of the study. A Google Sites (<https://sites.google.com>) website was the central point of the ecosystem. It contained all the important information,

<u>Point Scoring Table</u>	
<i>Weekly points maximum score = 100 points</i>	
<u>Quest:</u> 50 point maximum (<i>due = before the start of Friday's class</i>)	
☐	50 points for successfully completing 1 quest
☐	30 points for 50% to 99% quest completion
☐	15 points for 1% to 49% quest completion
☐	0 points for no quest post on blog
<u>Extensive Reading:</u> 30 point maximum (<i>due = Thursday 11:59pm</i>)	
☐	30 points for reading 1 book and passing the quiz
☐	15 points for attempting at least 1 quiz but not passing a quiz
☐	0 points for not attempting quiz
<u>English Central:</u> 20 point maximum (<i>due = Friday 9:00am</i>)	
☐	20 points for 100% completion (<i>100% = Watch 3 videos, Speak 3 videos</i>)
☐	10 points for 50% - 99% completion
☐	5 points for 1%- 49% completion
☐	0 points for 0% completion

Figure 1 Point Scoring Table

hyperlinks to the quests and learning activities, and the leaderboards. The leaderboards were created using Google Sheets (<https://sheets.google.com>) spreadsheets. Every Friday, after all the participants' scores had been confirmed, the scores were entered into two spreadsheets. One spreadsheet tracked the weekly scores, and the other tracked the overall total points accumulated scores. The participants were sorted from high to low based on their number of points. The sorted spreadsheets were embedded into the class website, and they acted as leaderboards. Figure 2 shows the weekly leaderboard at Week 10, and Figure 3 displays the overall leaderboard at Week 10.

Data Collection Instruments

Data were collected from two sources: a leaderboard questionnaire and performance-related data. The quantitative performance data showed the amount of work the participants had completed each week and overall, and their leaderboard rankings. The leaderboard questionnaire was a self-report questionnaire for the participants to indicate the emotion(s) they experienced when they viewed the weekly and overall leaderboards. The participants could select from ten emotions, and they could pick up to six of them to represent the complexity of their emotional response to viewing their leaderboard standing. The emotion(s) that could be selected were *hope*, *enjoyment*, *determined*, *pride*, *surprised*, *shame*, *anxiety*, *envy*, *hopelessness*, and *other*. After choosing the emotion(s), the participants then had to explain why they chose the emotion(s). The choice of emotions and the questionnaire design were created based on the Achievement Emotions Questionnaire (Pekrun et al., 2011) and from findings from Philpott (2015). The participants completed the survey at Week 6 (Survey #1), Week 10 (Survey #2), and Week 14 (Survey #3). It was administered using Survey Monkey (<https://www.surveymonkey.com>). It took approximately 2-3 minutes to complete. The survey was presented in Japanese and English, and the participants could respond in either language. Appendix A presents the questionnaire.

Weekly Leaderboards					
Weekly Leaderboards 37					
Weekly Ranking	Name	Quest points (50)	Reading (30)	E.C. (20)	Weekly Total
1	Aoi	50	30	20	100
1	Luca	50	30	20	100
1	Maho	50	30	20	100
1	Mana	50	30	20	100
1	Momo	50	30	20	100
1	Natsumi	50	30	20	100
1	Reiko	50	30	20	100
1	Rinko	50	30	20	100
1	Sara	50	30	20	100
1	Seiichiro	50	30	20	100
1	Taishin	50	30	20	100
1	Takuya	50	30	20	100
1	Yuki S	50	30	20	100
1	Yumi	50	30	20	100
1	Yuya	50	30	20	100
16	Honami	50	15	20	85
16	Soichiro	50	15	20	85
16	Sora	50	15	20	85
16	Tabito	50	15	20	85
16	Yuki K	50	15	20	85
21	Mitchel	50	0	20	70
21	Taishi	50	0	20	70
23	Haruko	0	30	20	50
23	Kento	0	30	20	50
25	Hiroyuki	30	0	0	30
26	Shinwa	0	0	0	0

Figure 2 Weekly Points Leaderboard at Week 10

Note. Names are pseudonyms chosen by each participant.

Overall Leaderboard		
Overall Leaderboard		
Overall Ranking	Name	Total Points
1	Aoi	1100
1	Luca	1100
1	Maho	1100
1	Mana	1100
1	Momo	1100
1	Natsumi	1100
1	Rinko	1100
1	Sara	1100
1	Takuya	1100
1	Yuki S	1100
11	Yumi	1090
12	Honami	1085
12	Reiko	1085
12	Seiichiro	1085
12	Yuki K	1085
16	Sora	1040
17	Haruko	1035
18	Yuya	1020
19	Tabito	1015
20	Kento	970
21	Soichiro	945
22	Mitchel	875
23	Hiroyuki	850
24	Taishi	820
25	Taishin	790
26	Shinwa	775

Figure 3 Overall Points Leaderboard at Week 10

Note. Names are pseudonyms chosen by each participant.

Procedures

Prior to the beginning of the study, all details of the course and the study were explained to potential participants in Japanese and English. It was clearly explained to them that participation in the study was not mandatory. All potential participants chose to participate, and informed consent was obtained from them. The leaderboard questionnaire data were transferred as an SPSS file from Survey Monkey to the teacher's computer. The performance-related data from the quest scoring form, MReader, and English Central were collected and tabulated in an Excel spreadsheet every Friday. The qualitative data written in Japanese were translated into English by a translator and then back-translated by a different translator into Japanese. The human translators discussed and resolved any differences between the back-translated and original scripts. The process of back-translation strengthened the accuracy of translations (Tyupa, 2011).

Data Analysis

The data analysis procedures used in the study are outlined in Table 1. Microsoft Excel was used to perform descriptive analyses on the performance and emotion frequency data. The participants' reasons why they chose an emotion were analysed using a thematic quantitative content analysis (Cohen et al., 2011) using NVivo version 12. The reasons were coded using structural coding, open coding, and sentiment coding. Then axial codes were created to categorise the open codes into themes that emerged from the data. An external code checker was used to check the accuracy of the codes (recommended by Lynch, 2003). Based on the minimal benchmark recommendation of 85–90% (Saldaña, 2015), the inter-coder reliability results were acceptable. To compare the weight of specific themes in the data, the thematic categories were analysed using rank order frequency of comparison.

Table 1 *Summary of Data Analysis Procedures*

Data	Analysis
Performance data	• Descriptive analysis
Leaderboard questionnaire	• Emotion frequency: Descriptive analysis • Emotion reasons: Content analysis • Emotion reasons: Rank order comparison

Results

Each Emotion Chosen

The results of the leaderboard questionnaire showed highly similar results between the participants' responses to the overall and weekly leaderboards. Therefore, to simplify the process, the averages of the overall and weekly leaderboards are presented and discussed unless mentioned otherwise. For each survey, on average, 39.17 emotions were reported with each participant reporting 1.53 emotions. Figure 5 shows the total % of each emotion: *determined* (41.28% of all emotions recorded), *enjoyment* (21.7%), *anxiety* (8.9%), *hope* (6.8%), *pride* (6.38%), *shame* (4.67%). *Other* (6.38% of total codes), *hopelessness* (2.1%), *surprised* (1.7% of total codes), and *envy* (0% of total codes) were removed from Figure 4 as they were insignificant or reported so infrequently.

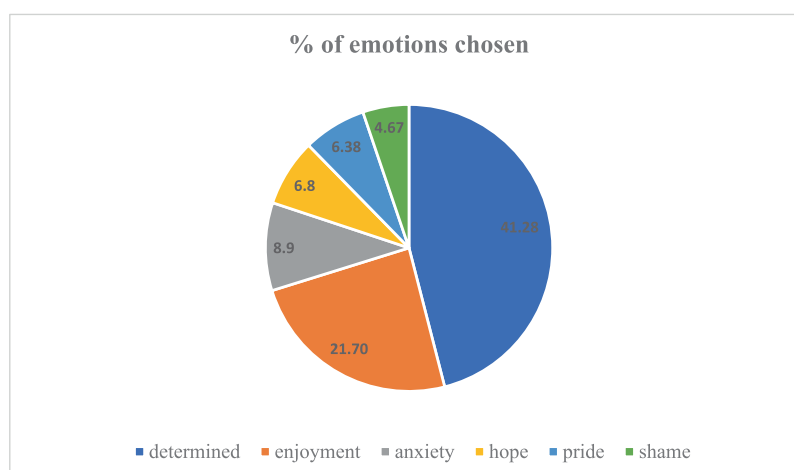


Figure 4 Percentage of all Emotions Chosen

Emotion Frequency by Survey

Figure 5 shows the frequency of each emotion for each survey. *Determined* was the most frequently selected emotion. On average, it was selected by 16 participants (63%) for each survey; 22 participants (85%) for Survey 1, 16 participants (64%) for Survey 2, and 10.5 participants (40%) for Survey 3. *Enjoyment* was the second most frequently selected emotion. On average, it was selected by 8.50 participants (33%) for each survey; 9.50 participants (37%) for Survey 1, 7 participants (28%) for Survey 2, and 9 participants (35%) for Survey 3. *Anxiety* was the third most frequently self-reported emotion. On average, for each survey, about four participants (14%) reported it; 1.5 participants (6%) for Survey 1, 6 participants (24%) for Survey 2, and 3 participants (12%) for Survey 3. The fourth and fifth most frequently self-reported emotions were *hope* and *pride* respectively with about three participants (10%) reporting them for each survey. Finally, the remaining emotions *shame*, *hopelessness*, *surprised*, and *envy* were reported 7%, 3%, 3%, and 0% respectively. *Hopelessness*, *surprised*, and *envy* were removed from Figure 5 as they were reported so infrequently.

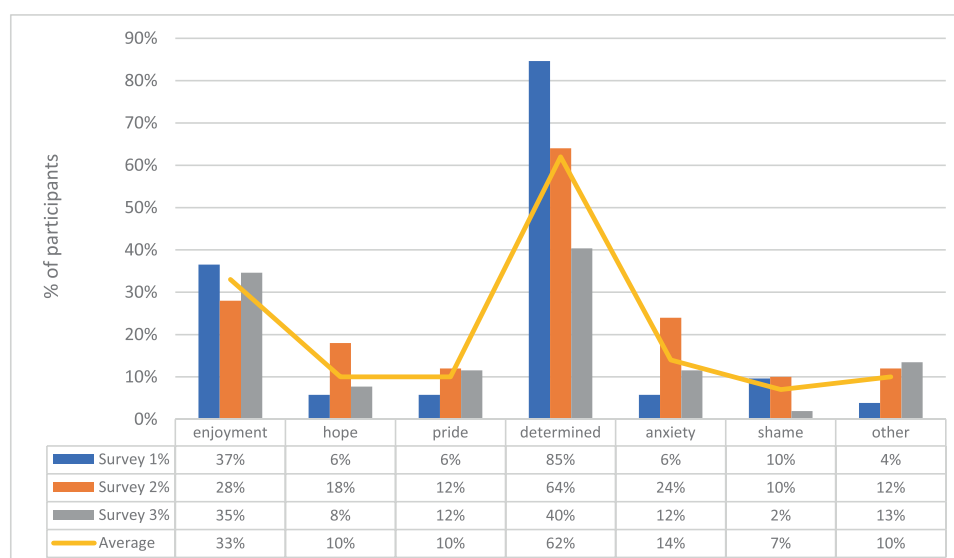


Figure 5 Emotion Frequency by Survey

Emotion Frequency by Leaderboard Rank

The frequency that each emotion was chosen was examined in relation to participants' final leaderboard score and rank. The participants were categorised as low, medium, or high ranked. The high group consisted of nine participants who finished the study with the maximum 1300 points. The middle group consisted of nine participants who finished the study with 1200 to 1299 points. The low group consisted of eight participants who finished the study with a final score of less than 1200. Based on the participants' final leaderboard rank, Figure 6 presents the average frequency that each emotion was chosen for each survey. It shows noticeable differences between the low group and the other groups. The positive emotions *enjoyment*, *determined*, *pride*, and *hope* were more frequently reported for the middle and high groups. In contrast, the negative emotions *shame*, *hopelessness*, and *anxiety* were more frequently reported for the low group.

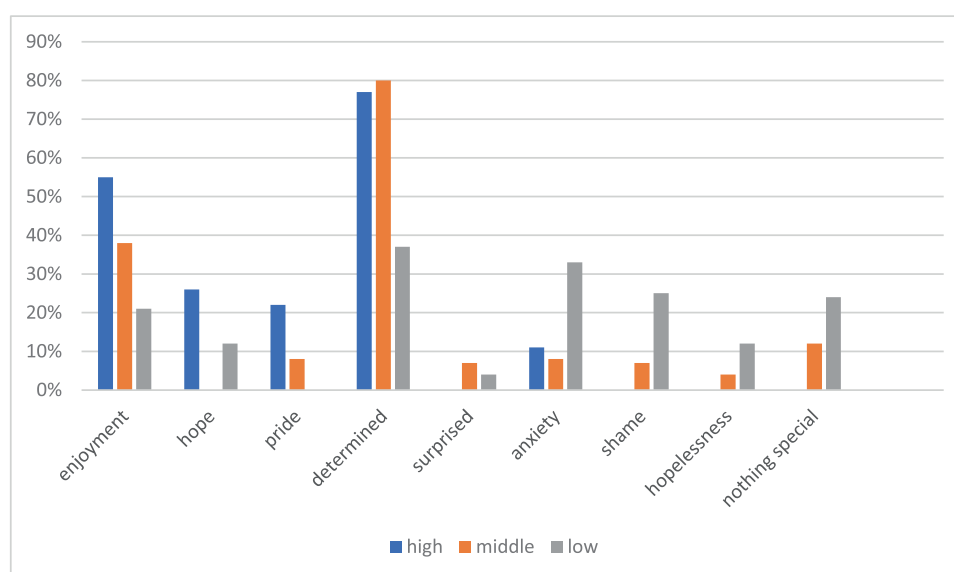


Figure 6 Emotion Frequency by Final Leaderboard Rank

Reasons for Choosing an Emotion

After the participants selected their respective emotions, they explained their selection. 235 responses in relation to the weekly and overall leaderboards were coded. Table 2 presents the results of the quantitative content analysis. It shows the reasons why an emotion was chosen and the frequency, weight, and rank of the reasons. For example, 34.69% of the time that *determined* was reported, the participants explained that they were motivated by rank (maintaining or increasing). *Determined* – motivated by rank was the most frequently coded sub-category overall, and it represented 14.47% of all responses. Some of the sub-categories were removed from Table 2 due to low reporting or insignificance.

Emotion Activation: Cross-Tabulation Results

The emotion data and the performance-related data were cross-tabulated to analyse the relationship between specific emotions and activated/deactivated behaviour. For Surveys 1 and 2, when a participant selected a particular emotion, that emotion was counted as present for that survey for that participant. Each participant could choose a maximum of six emotions to represent how they felt when

Table 2 *Frequency Relationship between Emotion and Reason*

Emotion and reason	Frequency (235)	Within emotion %	Overall	
			%	Rank
Determined	98			
Motivated by rank	34	34.69	14.47	1
Positive opinion about score	22	22.45	9.36	2
Felt sense of accomplishment	17	17.35	7.23	3
Motivated to do work	7	7.14	2.98	8
Negative social comparison	7	7.14	2.98	8
Enjoyment	51			
Motivated by rank	17	33.33	7.23	3
Felt sense of accomplishment	13	25.49	5.53	5
Positive opinion about score	8	15.69	3.40	7
Motivated to do work	6	11.76	2.55	11
Anxiety	22			
Negative feeling about rank	6	27.27	2.55	11
Negative social comparison	5	22.73	2.13	14
Negative personal feeling	3	13.64	1.28	18
Negative opinion about score	3	13.64	1.28	18
Positive opinion about score	3	13.64	1.28	18
Hope	16			
Positive opinion about score	5	31.25	2.13	14
Felt sense of accomplishment	4	25.00	1.70	17
Motivated by rank	2	12.50	.85	23
Motivated to do work	2	12.50	.85	23
Pride	20			
Felt sense of accomplishment	9	60.00	3.83	6
Motivated by rank	6	30.00	2.55	11
Positive opinion about score	5	33.33	2.13	14
Shame	11			
Negative social comparison	7	58.33	2.98	8
Negative feeling about rank	2	16.67	.85	23

they looked at the leaderboard. However, it was rare for a participant to choose over two emotions, and the average was 1.53 emotions. The performance-related data in the weeks (i.e., Week 5 and Week 9) immediately following Survey 1 (Week 4) and Survey 2 (Week 4) were used to determine activated behaviour. Participants were marked as having a *max score* if they received 100 points, or a *not max score* if they had fewer than 100 points. A max score was considered as activated behaviour, and a not max score was considered as not activated behaviour. After Survey 1, 21 of the 26 participants received a max score, and, after Survey 2, 19 of the 25 participants received a max score.

Table 3 displays the activation data. For example, for *enjoyment*, 10 participants selected it in Survey 1, and all 10 of those participants got a max score in the following week. For Survey 2, eight participants chose it, and in the following week, seven of those participants received a max score.

Table 3 *Emotions and Following Week Performance Table*

Emotion	S1 n = 26	Week 5 max score n = 21	S2 n = 25	Week 9 max score n = 19	S1 & S2 mean max score %
enjoyment	10	10	8	7	94%
hope	2	2	6	5	92%
pride	2	2	3	3	100%
determined	22	18	17	15	85%
surprised	0	0	0	0	NA
anxiety	2	2	7	4	79%
shame	3	0	3	0	0%
hopelessness	0	0	3	1	33%
envy	0	0	0	0	NA
nothing special	1	1	4	2	75%

Note. S = survey, for example S1 = Survey 1.

On average, 94% of the time that *enjoyment* was chosen, the participants received a max score in the following week. *Enjoyment* had an activation score of 94%. As Survey 3 occurred in the final week of the study, the emotion data is not presented in Table 3 as there was no following week. A value of 0 in Table 3 indicates that the emotion was measured but not selected by any participants in that survey.

Discussion

Ranked from the most frequent to the least frequent, when a participant looked at their leaderboard rank, they chose: (1) *determined* (41.28% of the time), (2) *enjoyment* (21.7%), (3) *anxiety* (8.9%), (4) *hope* (6.8%), (5) *pride* (6.38%), and (6) *shame* (4.67%). 76.16% of the reported emotions were positive (*determined*, *enjoyment*, *hope*, *pride*), and 15.67% negative (*anxiety*, *shame*, *hopelessness*). *Determined* and *enjoyment* were clearly the most frequently chosen emotions; 63% of all the reported emotions were either one of them. The relative high frequency of the positive emotions supports the literature (e.g., Aldemir et al., 2018; Cheong et al., 2013; De Schutter & Abeeel, 2014; Jia et al., 2017), which argues that from a student's perspective, leaderboards are enjoyable, engaging, and motivating. The emotions *enjoyment*, *determined*, *pride*, and *hope* were more commonly reported for the middle and high ranked groups. In contrast, the negative emotions *hopelessness*, *shame*, and *anxiety* were more frequently reported for the low group. This finding confirms the literature (Cao et al., 2022; Cheong et al., 2013; Philpott, 2015) that found a relationship between high leaderboard ranking and positive emotions, and low leaderboard ranking and negative emotions. The relative low frequency of the negative emotions *shame*, *anxiety*, and *hopelessness* also supports the literature (e.g., Barata et al., 2013; Charles et al., 2011; Domínguez et al., 2013; Nicholson, 2013), which found only few students had negative attitudes towards leaderboards.

After the participants had chosen an emotion, they explained why they chose that emotion. Ranked from most to least frequent, participants reported selecting *determined* due to positive feelings related to the ranking and point systems, as well as feelings of accomplishment and motivation when viewing the leaderboard. The reasons were largely similar for the other positive emotions (i.e., *hope*, *enjoyment*, *pride*). The reasons explaining why *determined* was chosen align with motivational factors discussed in the literature (e.g., Aldemir et al., 2018; Domínguez et al., 2013; Landers et al., 2015; Mekler et al., 2013; Pi et al., 2024; Tan & Hew, 2016), particularly in relation to goal orientation, feedback, and social comparison.

The most frequent reasons for choosing a negative emotion (i.e., *anxiety*, *shame*, *hopelessness*) were related to negative feelings about rank and the public display of their rank or low score. Previous studies (e.g., Barata et al., 2013; Charles et al., 2011; Domínguez et al., 2013; Nicholson, 2013) presented similar findings related to negative feelings deriving from the comparative and competitive aspects of leaderboards. The reasons for choosing a negative emotion also provide further support to Aldemir et al. (2018), who found that, in a gamified course, anxiety can emerge under time and performance-related pressures. The reasons for choosing either positive or negative emotions confirm the findings from the literature (e.g., Aldemir et al., 2018; Domínguez et al., 2013; Tan & Hew, 2016), which suggest that leaderboards may be associated with subsequent task completion through social comparison.

The data were analysed to determine if there was a relationship between choosing a specific emotion and performance in the following week. The results presented in Table 3 showed that, if the participants chose a positive emotion, they were more likely to achieve a maximum score in the following week. If the participants chose a negative emotion, they were less likely to achieve a maximum score in the following week. Several other interesting results emerged from the data. First, only the emotion *pride* had 100% activation in both Week 5 and Week 9. Second, the proportion of participants who chose *anxiety* increased noticeably between Survey 1 (6%) and Survey 2 (24%). However, after Survey 1, 100% of the participants who chose *anxiety* went on to get a maximum score in Week 5, whereas after Survey 2, only 57% of the participants who chose *anxiety* went on to get a maximum score in Week 9. This could suggest that *anxiety* was initially useful for activating behaviour; however, its efficacy declined as the study progressed. Third, *shame* had the most negative activation results. If the participants chose *shame*, they never achieved a maximum score in the following week. Fourth, *hopelessness* was not reported for Survey 1, but it was reported for Survey 2. Only one of the three participants who chose *hopelessness* went on to get a maximum score in the following week.

Because the positive emotions were more frequently chosen by higher performing participants, and because there was a connection between choosing a positive emotion and performing well, it appears that a leaderboard is more likely to have a positive behavioural effect on higher-ranked participants. The finding supports previous studies (e.g., Aldemir et al., 2018; Bai et al., 2021; Buckley et al., 2017; Çakıroğlu et al., 2017; Cao et al., 2022; Lafleur, 2024; Tan & Hew, 2016; Tran & Zeckhauser 2012; Werbach & Hunter, 2020), which suggest that a leaderboard that is competitive and social may have a positive impact on higher-performing students. From a behaviourism perspective (e.g., Fester & Skinner, 1957), this pattern may be explained by the constant positive feedback received by higher-ranked participants, which may have supported their motivation. For the low ranked participants, they did not receive the same positive feedback once their performance declined, echoing prior research (i.e., Ma et al., 2025) showing negative experiences can arise when technology is not equally supportive for all learners. A mechanism within the leaderboard system, which allowed participants to catch up to higher-ranked participants by doing extra work, might have remedied this issue.

Conclusion

The study aimed to explore the emotions EFL students' felt when they saw their leaderboard ranking, the reasons why they felt those emotions, and the relationship between the emotion and performance in the following week. The results of the study showed that the positive emotions *determined* and *enjoyment* were noticeably more frequently chosen than any of the other emotions. The positive emotions *determined*, *enjoyment*, *hope*, and *pride* were more frequently reported for the high and middle ranked students, and the negative emotions *shame*, *hopelessness*, and *anxiety* were more frequently reported for the low performing students. The participants chose the positive emotions because they

felt motivated by the ranking system, positively about the scoring system, and a sense of accomplishment when they looked at the leaderboard.

When the participants chose a negative emotion, they explained that it was due to negative feelings related to their rank and, more specifically, their rank being publicly displayed. When the participants selected a positive emotion, they had a higher likelihood of attaining a full performance score in the following week. When the participants selected a negative emotion, it was less likely they would attain a full performance score in the following week. These findings may suggest that the positive social comparison and feedback a leaderboard provides are beneficial for high and average performing students, but the negative social comparison and negative feedback a leaderboard provides are detrimental to low performing students. Therefore, teachers looking to implement a leaderboard should consider the best approach for maximising positive emotions and minimising negative emotions. Cao et al. (2022) recommend that this could be achieved by designing leaderboards with achievable difficulty that does not overwhelm students with difficult competition.

The findings of the study come with limitations. First, the finding about how often emotions activated behaviour is far from conclusive. The dichotomy of activation employed might have been overly simplistic; without the leaderboard, a participant might not have engaged in any work at all. The leaderboard might have motivated them to finish 50% or 80% of their tasks in the subsequent week. However, if they did not achieve the maximum score in the following week, the selected emotion was marked as deactivated. Perhaps activation should have been gauged by whether a participant's score shifted, rather than if they achieved a full score or not. Having previously taught the participants before the study, the teacher observed from the performance data that, even if the lower-ranked participants did not consistently reach the maximum weekly points, their performance was better with the presence of the leaderboard. The leaderboard was constantly reminding them to complete their homework and threatening them with social embarrassment if they failed to do so. Second, anxiety in L2/FL language learning is not necessarily a negative emotion. Krashen (2009) argues that anxiety is a critical attribute for L2/FL learning as it can increase students' motivation and focus. However, in this context, it was more widely reported by the low performing participants, and it did not lead to strong activation results compared to the positive emotions. Future studies could look to replicate the findings in different cultural contexts and employ larger samples with more frequent measurement points per participant to enable more robust statistical analyses, including examination of how combinations of co-occurring emotions relate to subsequent task completion outcomes. Future research could also investigate how teachers using leaderboard systems can offer alternative pathways to success for lower-performing students, for example by drawing on Universal Design for Learning principles.

Conflict of Interest Statement

There is no conflict of interest.

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Appendix A

Leaderboard Questionnaire リーダーボードについての質問表

Please answer the questions below honestly. I am interested to know how leaderboards affect you. 以下の質問に正直に答えて下さい。リーダーボードがどのようにあなたに影響を与えたのかに興味があります。

1. How do you feel when you see your leaderboard ranking this week? You can choose more than 1 answer if you want to. リーダーボードを見た時どのように感じましたか。
(一つ以上選択可)
 - a. enjoyment 楽しみ
 - b. hope 希望
 - c. pride 誇り
 - d. determined やる気になった
 - e. surprised 驚き
 - f. anxiety 心配
 - g. shame 恥かしさ
 - h. hopelessness 絶望
 - i. envy 嫉妬
 - j. Other (please specify) 他?
2. Why did you choose the previous answer? なぜその答えにしましたか?