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Article

Micro-Level Network Structures of Foreign Language Enjoyment and Boredom: A Comparative Study of English and Non-English Majors

Nanxuan Li [1,*,†] and Xia Hong [2,†]

[1] Faculty of Arts and Humanities, University of Southampton, Southampton, England
[2] Department of Basic Education, Qiannan Preschool Education College for Nationalities, Guiding, Guizhou, China
* Correspondence: Nanxuan Li, Faculty of Arts and Humanities, University of Southampton, Southampton, England
† These authors contributed equally to this work

Abstract: This study adopts a network analytic approach to examine the micro-level structures of Foreign Language Enjoyment (FLE) and Foreign Language Learning Boredom (FLLB) and to compare their configurations between English majors and non-English majors in the Chinese EFL context. Using convenience sampling, 332 first-year students from a comprehensive college in southern China (128 English majors; 204 non-English majors) completed the Chinese Version of the Foreign Language Enjoyment Scale (CFLES) and the Foreign Language Learning Boredom Scale-Short Form (FLLBS-SF). Gaussian Graphical Models were estimated separately for each group, followed by case-dropping bootstrap stability tests, centrality and bridge-centrality analyses, and a Network Comparison Test (NCT). Results showed that for both FLE and FLLB, the two groups did not differ significantly in overall network structure or global strength, suggesting largely comparable emotional system organization across majors. In both groups, nodes clustered in line with the theorized dimensions, providing network-level structural support for construct validity. At the node level, learning enjoyment emerged as a central hub of FLE across groups, whereas teacher-related nodes (e.g., friendliness/support) and atmosphere-related nodes (e.g., good atmosphere/positive environment) displayed group-specific prominence and bridging roles. For FLLB, central "hotspots" differed: English majors' boredom centered on classroom phenomenology (time dragging perception and low engagement), whereas non-English majors' boredom additionally highlighted exercise monotony and general dullness. Bridge analyses further revealed distinct cross-dimensional diffusion pathways, indicating that repetitive exercises and generalized dullness were key connectors in English majors, while classroom boredom and listening dullness functioned as stronger bridges in non-English majors. Stability indices suggested that centrality estimates, especially in the English-major networks, should be interpreted cautiously.

Keywords: foreign language enjoyment; foreign language learning boredom; network analysis; Gaussian graphical model; network comparison test; centrality; bridge strength

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1. Introduction

Foreign language emotions have attracted increasing scholarly attention in recent years, particularly Foreign Language Enjoyment (FLE) and Foreign Language Learning Boredom (FLLB). Prior research has predominantly approached foreign language emotions from a macro-level perspective, conceptualizing them as either antecedent variables that predict learning outcomes (e.g., achievement, motivation, and engagement)

or as outcome variables influenced by learner-related and contextual factors. Although such variable-centered approaches have substantially advanced our understanding of the functional roles of emotions, they often overlook the complex interplay among individual emotional components. Consequently, little is known about how specific emotional experiences interact within a broader emotional system. Drawing on a network analytic framework, the present study investigates the micro-level structural organization of FLE and FLLB among English and non-English majors. By comparing network configurations, central nodes, and bridge connections, this study aims to provide a more fine-grained understanding of the internal dynamics of positive and negative emotions across academic backgrounds.

2. Literature Review

Drawing on the foundational insights of the Broaden-and-Build Theory and the Control-Value Theory, scholars have increasingly incorporated principles of positive psychology into the field of Second Language Acquisition (SLA) [1,2]. Currently, FLE has emerged as the most extensively investigated positive emotion in the field of SLA, representing a central construct within the growing body of research inspired by positive psychology. Foreign Language Enjoyment (FLE) was first conceptualized through the development of a 21-item questionnaire to investigate learners' FLE across diverse global contexts [3]. This pioneering work provided a systematic operationalization of the construct and laid the empirical foundation for subsequent research on positive emotions in SLA. The original FLE scale was later adapted for Chinese senior high school students and refined into an 11-item instrument. This validation identified a three-factor structure comprising Private, Teacher, and Atmosphere dimensions [4].

Boredom is a detrimental academic emotion that can negatively affect learners' behavioral involvement, motivational intensity, classroom engagement, academic performance, and strategic regulation within educational contexts [5]. The concept of FLLB was first formally introduced based on control-value theory, leading to the development and validation of a corresponding measurement instrument [5]. In subsequent research, the original scale was re-examined, observing that learners' boredom could extend beyond the classroom context. Accordingly, an 11-item Foreign Language Learning Boredom Scale-Short Form (FLLBS-SF) was constructed and its psychometric properties were further validated within the Chinese educational context [6].

Network analysis was employed to explore the micro-level associations among items and to identify central and bridge nodes within the emotional system. Compared with traditional latent variable modeling, network analysis conceptualizes psychological constructs as systems of mutually interacting components rather than as reflections of an underlying latent factor. Therefore, it provides complementary evidence for construct validity by examining whether theoretically related items cluster together and whether cross-construct connections are limited [7,8]. In addition, network analysis allows researchers to examine structural differences between groups at a micro level, providing deeper insights into how emotional systems are organized across groups rather than merely identifying mean differences [9].

Recent empirical work has begun applying psychological network analysis to explore the complex interrelations among foreign language emotions such as FLE, anxiety, and boredom. For example, a recent study modeled the conditional associations among multiple SLA emotion variables and engagement outcomes using a network framework, providing insights beyond simple correlation or regression analyses [10]. Additionally, methodological reviews have highlighted the promise of network analysis for modeling complex dynamic systems in SLA, underscoring its utility for examining interconnected affective constructs such as enjoyment and boredom [11].

Despite extensive research on FLE and FLLB, prior studies have largely relied on variable-centered approaches, emphasizing overall scores and mean differences while

overlooking micro-level interactions among emotional components. Although network analysis has emerged in SLA research, comparative investigations of the internal network structures of FLE and FLLB across academic groups remain scarce. To address these gaps, the present study employs network analysis to investigate the micro-level structures of FLE and FLLB and to compare their configurations between English majors and non-English majors. Accordingly, the following research questions are proposed:

RQ1: What are the network structures of FLE and FLLB among English and non-English majors?

RQ2: Do the two groups differ in overall network structure and global strength?

RQ3: Which nodes are most central and serve as key bridges within each group's networks?

3. Methodology

3.1. Participants

Using convenience sampling, an online questionnaire was administered to first-year students at a comprehensive college in southern China. All participants provided electronic informed consent. The sample included 128 English majors (38.6%) and 204 non-English majors (61.4%), yielding a total of 332 respondents.

3.2. Instruments

After collecting demographic information (i.e., major type: English majors vs. non-English majors), participants completed two validated emotion scales measuring Foreign Language Enjoyment (FLE) and Foreign Language Learning Boredom (FLLB), respectively.

1. *Chinese Version of the Foreign Language Enjoyment Scale (CFLES).* Foreign Language Enjoyment was measured using the Chinese Version of the Foreign Language Enjoyment Scale (CFLES) developed and validated by Li et al [4].. The scale was validated in the Chinese EFL context through exploratory and confirmatory factor analyses. The final version consists of 11 items loading on three dimensions: FLE-Private (item 1, 2, 3, 4 and 6), FLE-Teacher (item 7, 8 and 9) and FLE-Atmosphere (item 5, 10 and 11). All items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The original study reported satisfactory internal consistency (α = .826 for the total scale; .792 for FLE-Private; .896 for FLE-Teacher; and .778 for FLE-Atmosphere).In the present study, the scale also demonstrated high reliability. Cronbach's alpha coefficients were .897 for FLE-Private, .902 for FLE-Teacher, and .897 for FLE-Atmosphere, with an overall reliability of .909, indicating excellent internal consistency.
2. Foreign Language Learning Boredom was assessed using the Foreign Language Learning Boredom Scale-Short Form (FLLBS-SF), which was developed and validated in prior research [6]. The scale was refined from the original 32-item FLLBS and validated using large-scale samples across different educational levels in China. The short form includes 11 items representing three dimensions: Foreign Language Classroom Boredom (item 1-4), Foreign Language Activity Boredom (item 5-8), and General Learning Boredom (item 9-11). Participants responded using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The original validation study reported excellent internal consistency (α values above .90 for the total scale across datasets). In the current study, the reliability indices were also high: Cronbach's alpha was .931 for Foreign Language Classroom Boredom, .929 for Foreign Language Activity Boredom, and .900 for General Learning Boredom. The overall reliability coefficient for the FLLBS-SF was .949, indicating excellent internal consistency.

3.3. Data analysis

Data analysis was conducted using a combination of SPSS and R. First, descriptive statistics (means and standard deviations) were computed in SPSS 27.0 to examine the overall levels and dispersion of FLE and FLLB items. Subsequently, all network analyses were performed in R 4.5.2. Gaussian Graphical Models were estimated separately for English major and non-English major groups to explore partial correlation structures. Network stability was evaluated using case-dropping bootstrap procedures, and correlation stability (CS) coefficients were reported. A Network Comparison Test (NCT) was conducted to assess structural invariance and global strength differences. Finally, strength and bridge strength centrality indices were calculated to identify key and cross-dimensional nodes.

4. Results

4.1. Foreign language enjoyment (FLE)

4.1.1. Descriptive statistics of FLE

Table 1 presents the descriptive statistics of Foreign Language Enjoyment (FLE). Overall, participants reported moderately high levels of enjoyment. At the dimensional level, teacher-related enjoyment showed the highest scores, indicating strong and consistent positive perceptions of teacher support and encouragement. Private enjoyment reflected moderate levels. In contrast, atmosphere-related enjoyment displayed the lowest overall means. Standard deviations suggested acceptable variability across items, providing sufficient dispersion for network estimation.

Table 1. Descriptive statistics of FLE among all participants

Item	Mean	SD
1. I don't get bored. (Lack of boredom)	3.73	0.917
2. I enjoy it. (Learning enjoyment)	3.52	0.966
3. I've learnt interesting things. (Interest in content)	3.72	0.891
4. In class, I feel proud of my accomplishments. (Sense of accomplishment)	3.11	1.039
5. It's a positive environment. (Positive classroom climate)	3.31	0.988
6. It's fun. (Learning fun)	3.59	0.92
7. The teacher is encouraging. (Teacher encouragement)	4.06	0.723
8. The teacher is friendly. (Teacher friendliness)	4.12	0.685
9. The teacher is supportive. (Teacher support)	4.11	0.669
10. There is a good atmosphere. (Supportive atmosphere)	3.46	0.987
11. We form a tight group. (Peer cohesion)	3.19	1.03

4.1.2. Network Structure of FLE

Figures 1 and 2 display the estimated FLE networks for English majors and non-English majors, respectively. In both groups, several strong positive partial correlations emerged among items reflecting similar conceptual domains. The consistency of dimensional clustering across groups provides structural support for the construct validity of FLE and indicates that the organization of enjoyment components is robust across academic majors. Despite this, visual inspection indicated that the strongest edge in both networks emerged between FLE_8 and FLE_9 (teacher friendliness and teacher support), suggesting that these two teacher-related enjoyment experiences were tightly interconnected across both English and non-English majors. Within the private enjoyment dimension (Items 1, 2, 3, 4, and 6), the non-English-major network appeared to show

relatively stronger interconnections compared to the English-major network. This suggests that internal enjoyment experiences may co-activate more strongly among non-English majors, whereas English majors displayed a relatively more differentiated internal emotional structure. In contrast, the atmosphere-related items (FLE_5 and FLE_11) appeared more weakly connected in the non-English-major group, indicating a looser structural integration of classroom atmosphere perceptions compared to the English-major group. Beyond within-dimension clustering, cross-dimensional connections showed subtle differences between groups. In the English major network, several cross-cluster edges were observed, particularly linking private enjoyment items with teacher- and atmosphere-related items. Notably, FLE_1 appeared to connect multiple clusters, suggesting a bridging role across enjoyment components. In contrast, the non-English major network exhibited a more modular structure, with clearer separation between private, teacher, and atmosphere clusters. Cross-dimensional connections were comparatively weaker and less frequent.

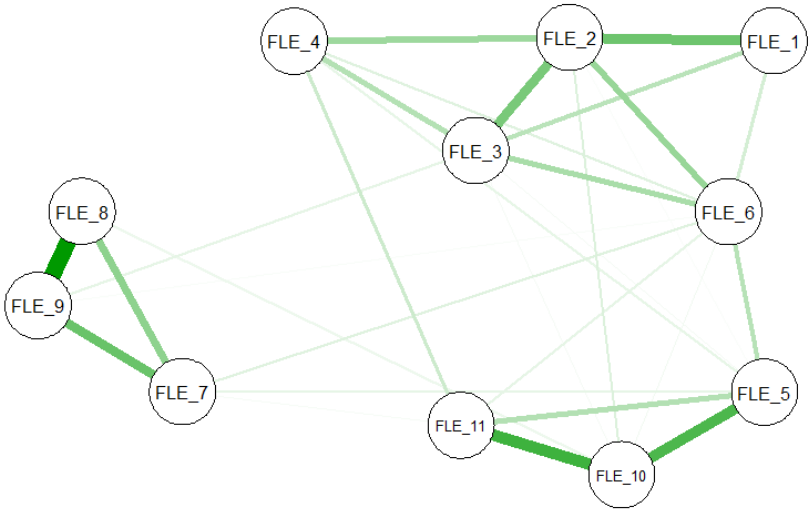

Figure 2. Non-English major FLE network

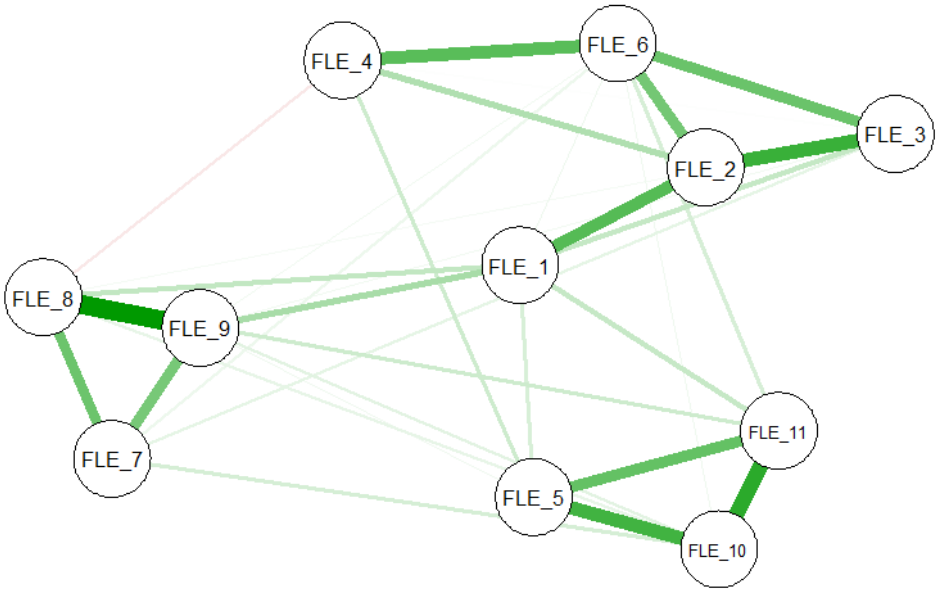

Figure 1. English major FLE network

4.1.3. Network stability analysis

Case-dropping bootstrap analysis was conducted to evaluate centrality stability. The CS-coefficient for strength centrality was 0.20 in the English major group and 0.52 in the non-English major group. While the non-English group demonstrated adequate stability (CS > .50), the English group fell below the recommended threshold, suggesting that centrality estimates in the English network should be interpreted with caution.

4.1.4. Network comparison test (NCT)

The network comparison test revealed no significant differences between English and non-English majors in terms of overall network structure (M = 0.22, p = 0.67) or global strength (S = 0.24, p = 0.31). These results indicate that the configuration and overall connectivity of FLE were statistically comparable across the two academic groups.

4.1.5. Centrality Analysis (Strength)

Figure 3 displays the strength centrality indices for each FLE item across English and non-English major networks. Overall, the centrality patterns were highly similar between the two groups. For the English major group, the nodes with the highest strength centrality were FLE_2 and FLE_8. For the non-English major group, the highest strength values were observed for FLE_2, FLE_10 and FLE_9.

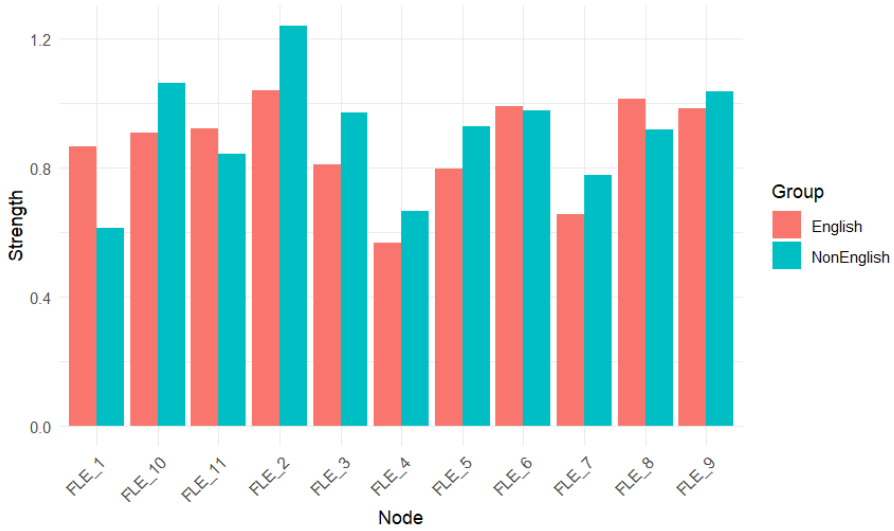

Figure 3. Strength comparison for English and non-English majors on FLE.

4.1.6. Bridge Strength Centrality

Bridge strength was estimated to examine cross-dimensional connections among FLE components. The results are shown in Figure 4. In the English major group, FLE_1 exhibited the highest bridge strength, followed by FLE_8 and FLE_9, suggesting that personal enjoyment may serve as a key connector between private and teacher-related dimensions. In contrast, in the non-English major group, FLE_6 and FLE_5 demonstrated relatively higher bridge strength values, indicating that classroom atmosphere and teacher-related enjoyment played a stronger cross-dimensional role.

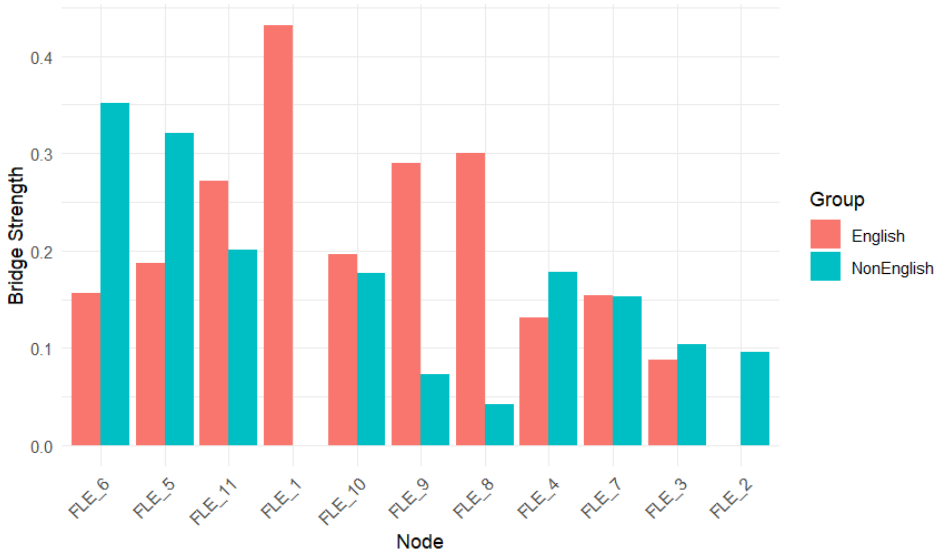

Figure 4. Bridge strength centrality comparison between English and non-English majors in the FLE networks

4.2. Foreign language learning boredom (FLLB)

4.2.1. Descriptive statistics

Descriptive statistics indicated that the three dimensions of foreign language learning boredom (classroom boredom, activity boredom, and general boredom) showed moderate mean levels in both English-major and non-English-major groups. Standard deviations suggested acceptable variability across items, providing sufficient dispersion for network estimation. Overall, preliminary statistics indicated comparable levels of boredom experience across the two academic groups (As shown in Table 2).

Table 2. Descriptive statistics of FLLB among all participants

Item	Mean	SD
1. The English class bores me. (Class boredom)	2.45	0.996
2. My mind begins to wander in the English class. (Attention drift)	2.66	1.055
3. Time is dragging on in English class. (Time dragging perception)	2.6	1.022
4. I always think about what else I might be doing to kill the time rather than sitting in this English class. (Low engagement)	2.55	1.005
5. An analysis of a long (English) text is dreary. (Reading dullness)	2.8	1.057
6. It is really boring to repeat the (English) text after the modeling audio. (Listening dullness)	2.61	1.03
7. So many similar types of (English) exercises make me lose interest. (Exercise monotony)	2.59	1.005
8. So much practice on the same (English-related) subject matter makes me restless. (Task repetitiveness)	2.58	1.021
9. I'm somebody who is not interested in studying. (Persistent boredom)	2.47	1.009
10. Studying (English) is dull in general. (General dullness)	2.28	0.919
11. I'm forced to learn all the subjects, including English. (External compulsion)	2.39	0.997

4.2.2. Network Structure of FLLB

Figure 5 and 6 present the estimated FLLB networks for English-major and non-English-major students. In both groups, nodes tended to cluster according to the original theoretical dimensions, with classroom boredom, activity boredom, and general boredom forming relatively distinct substructures. This pattern supports the structural coherence of the boredom construct at the network level. A visual comparison of the two network graphs revealed several noteworthy patterns. First, in both the English-major and non-English-major groups, the edge connecting Item 9 and Item 10 appeared to be among the strongest (i.e., thickest) in the network. This suggests that these two boredom indicators share a particularly strong association across academic backgrounds, potentially reflecting a tightly interconnected component within the general boredom dimension. Second, a noticeable difference emerged in the density of connections among Items 1-4. In the English-major group, the edges among these nodes appeared generally thicker than those observed in the non-English-major group. This pattern indicates relatively stronger partial correlations within this cluster for English-major students, suggesting that classroom-related boredom symptoms may be more tightly interconnected in this group.

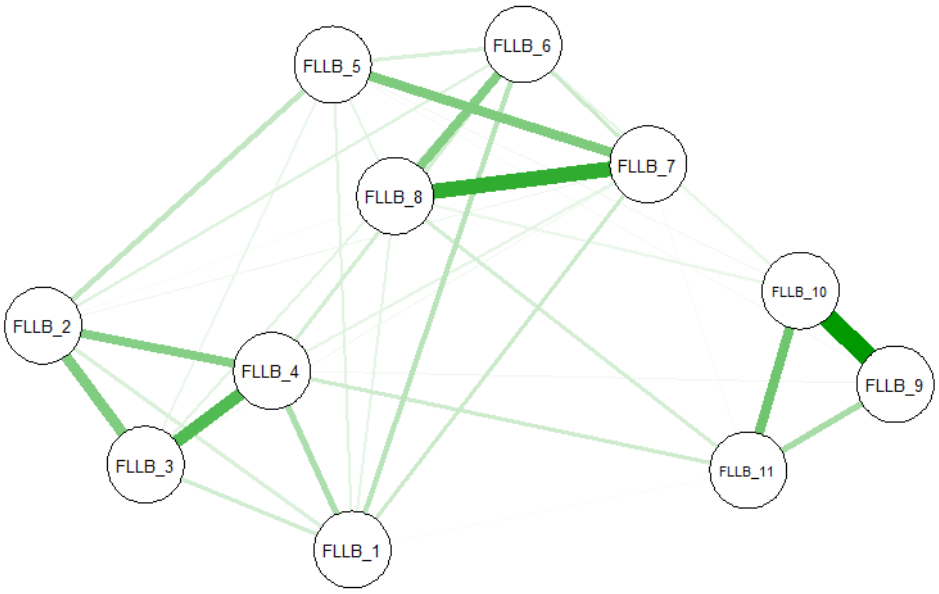

Figure 6. Non-English major FLLB network

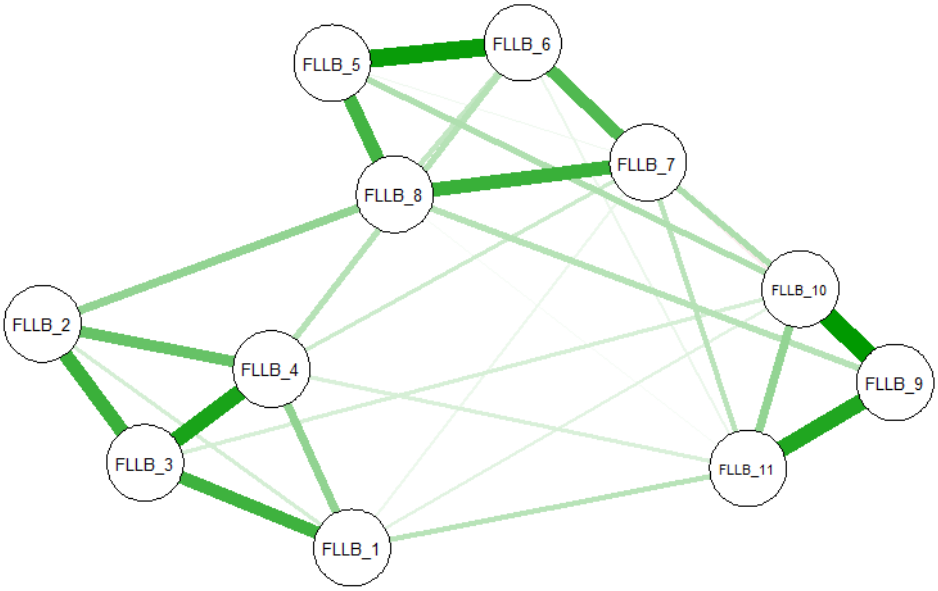

Figure 5. English major FLLB network.

4.2.3. Network stability analysis

To examine the robustness of the estimated networks, case-dropping bootstrap procedures were conducted. The correlation stability (CS) coefficient for strength centrality was 0.125 in the English-major group, which falls below the recommended minimum threshold of 0.25. This indicates that the centrality ranking in this group is relatively unstable and should be interpreted with caution. In contrast, the CS coefficient for strength in the non-English-major group was 0.284, exceeding the minimum acceptable level (0.25) but not reaching the preferred threshold of 0.50. This suggests that the centrality estimates in this group are moderately stable but still require cautious interpretation.

4.2.4. Network comparison test (NCT)

To examine whether the two networks differed structurally, a NCT was conducted. The network structure invariance test was non-significant. M = 0.321, p = 0.156, indicating that the overall configuration of the FLLB networks did not significantly differ between English-major and non-English-major students. Similarly, the global strength invariance test was non-significant. S = 0.072, p = 0.603. The global strength values were 5.243 for the English-major group and 5.171 for the non-English-major group, suggesting comparable overall connectivity between the two networks.

4.2.5. Centrality Analysis (Strength)

Figure 7 presents the comparison of strength centrality values for each FLLB node across English-major and non-English-major groups. For the English-major group, the highest strength values were observed for FLLB_3 and FLLB_4. These nodes occupied relatively central positions in the boredom network. For the non-English-major group, the most central nodes were FLLB_4, FLLB_7, and FLLB_10, all showing comparatively higher strength values than other items.

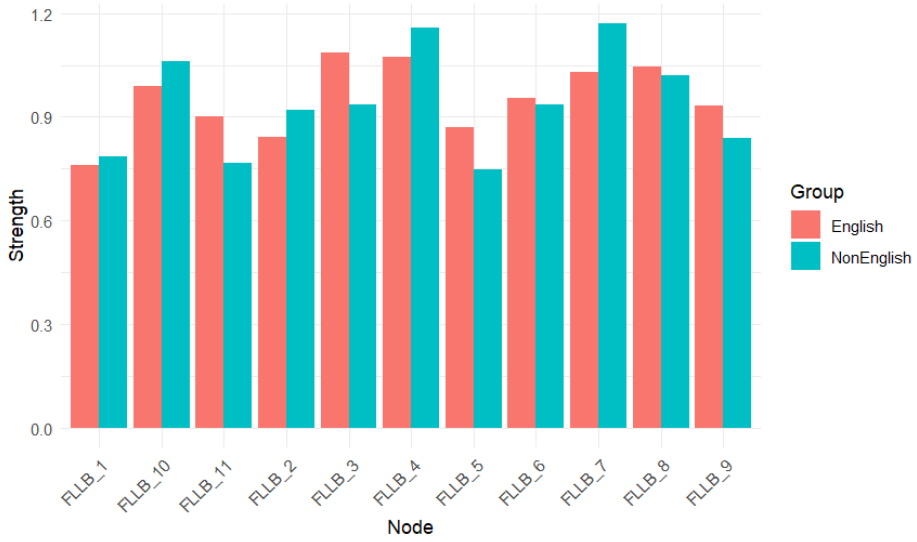

Figure 7. Strength comparison for English and non-English majors on FLLB.

4.2.6. Bridge Strength Centrality

Bridge strength results (see Figure 8) revealed distinct cross-dimensional patterns between the two groups. In the English-major network, FLLB_10 and FLLB_7 showed the highest bridge strength, suggesting that general boredom-related items play a key role in linking different boredom dimensions. In contrast, in the non-English-major group, FLLB_6 and FLLB_1 emerged as stronger bridge nodes, indicating that classroom and activity-related boredom may function as primary cross-dimensional connectors.

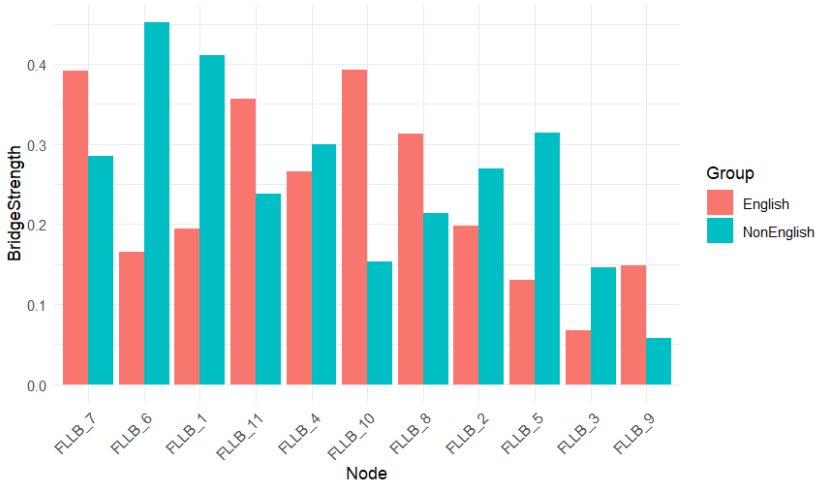

Figure 8. Bridge strength centrality comparison between English and non-English majors in the FLLB networks.

5. Discussion

5.1. The networks of FLE in English major group and non-English major group

Firstly, the NCT results indicated that there were no significant differences between English majors and non-English majors in terms of the global network structure or overall strength centrality of FLE. This finding suggests that the configuration and connectivity patterns of enjoyment components are largely stable across academic backgrounds. In other words, the way different enjoyment experiences interact appears to be structurally similar for both groups. Moreover, the network visualization showed that nodes clustered clearly according to the original theoretical dimensions of the FLE scale (i.e., private,

teacher, and atmosphere enjoyment). This dimensional clustering provides further structural support for the construct validity of the scale at the network level. Together, these results imply that foreign language enjoyment may represent a relatively robust and domain-general emotional system, whose internal organization remains consistent regardless of students' major specialization.

Secondly, the centrality results revealed both shared and group-specific patterns in the FLE networks. In both groups, learning enjoyment surfaced as the most central private-enjoyment node, which is meaningful because it captures a global, moment-to-moment affective appraisal ("I enjoy it") rather than a more specific outcome-focused feeling (e.g., pride in accomplishments) or a narrower hedonic reaction (e.g., "it's fun"). As a broad evaluative experience, learning enjoyment is likely to co-vary with multiple enjoyment facets simultaneously, making it a natural "hub" within the private dimension. For English majors, teacher friendliness was more central than other teacher-related items (e.g., encouragement/support) because friendliness signals stable interpersonal warmth and approachability, which can continuously shape classroom interactions, willingness to participate, and perceived safety-conditions that may matter particularly for students who engage more frequently and intensely with the teacher. For non-English majors, teacher support became more central, likely because instrumental help and scaffolding directly reduces difficulty and uncertainty, strengthening perceived control and value [2]; meanwhile, a good learning atmosphere stands out within the environment dimension as it reflects the overall socio-emotional climate, which can amplify or dampen enjoyment beyond what "tight group" cohesion alone captures.

Thirdly, the bridge strength analysis revealed distinct cross-dimensional connectors in the two groups. In the English-major network, lack of boredom, teacher support, and teacher friendliness emerged as the most important bridge nodes linking different FLE dimensions. This suggests that for English majors, reducing boredom functions as a key emotional hinge that connects private enjoyment with teacher- and atmosphere-related experiences. Meanwhile, teacher support and friendliness appear to transmit relational warmth and instructional guidance across dimensions, reinforcing the integration of personal and contextual enjoyment. In contrast, among non-English majors, a positive learning atmosphere and learning fun were the most prominent bridge nodes. This indicates that environmental positivity and immediate hedonic enjoyment serve as central connectors in their network. Rather than relational factors alone, the overall classroom climate and the perceived fun of learning may play a stronger integrative role, facilitating the spread of enjoyment across personal and contextual domains. These findings highlight different emotional transmission mechanisms across academic backgrounds.

5.2. The networks of FLLB in English major group and non-English major group

Firstly, The NCT results indicated no significant differences between English majors and non-English majors in the global network structure or overall strength centrality of FLLB. This suggests that the configuration and connectivity of boredom symptoms are largely comparable across academic backgrounds. Furthermore, the network visualization showed that nodes clustered clearly according to the original theoretical dimensions of the FLLB scale (i.e., classroom, activity, and general boredom). Such clustering provides structural support for the multidimensional construct validity of foreign language learning boredom. Overall, FLLB appears to represent a relatively stable emotional system whose internal organization remains consistent across different learner groups.

Secondly, the centrality findings suggest both shared and group-specific "hotspots" within the FLLB networks. For English majors, the most central nodes were time dragging perception and low engagement, both located in the classroom boredom dimension. These items capture the in-situ phenomenology of boredom-subjective time slowing and disengaged attention-rather than task-specific irritation (e.g., reading or listening dullness). As such, they likely co-occur with multiple boredom manifestations and readily

activate downstream reactions (e.g., restlessness, reduced interest), making them natural hubs in the network. This pattern implies that English majors' boredom may be driven more by classroom-level pacing and attentional regulation during lessons. For non-English majors, low engagement again emerged as central, but it was accompanied by exercise monotony (activity boredom) and general dullness (general boredom). This combination suggests a broader boredom system in which repetitive practice can generalize into a more pervasive sense that "English is dull overall." In this group, a routine-heavy learning experience may therefore serve as a key pathway through which activity boredom escalates into more generalized disengagement.

Thirdly, the bridge strength analysis revealed distinct cross-dimensional connectors within the FLLB networks. In the English-major group, exercise monotony (activity boredom) and general dullness (general boredom) emerged as the most important bridge nodes linking different boredom dimensions. This pattern suggests that repetitive exercises may function as a proximal trigger that extends beyond specific tasks and gradually generalizes into an overall sense that English learning is dull. Once boredom becomes generalized, it can more easily spread across classroom- and activity-related experiences, reinforcing the interconnectedness of the network. In contrast, among non-English majors, classroom boredom and listening dullness were the most prominent bridge nodes. Here, boredom appears to be transmitted from immediate classroom experiences and modality-specific tasks (e.g., listening repetition) to broader boredom states. This indicates that situational instructional features may play a more direct integrative role in shaping the boredom network of non-English majors, highlighting different internal diffusion pathways of boredom across groups.

5.3. Pedagogical implications

Based on the above findings, several pedagogical implications can be drawn. First, given that learning enjoyment ("I enjoy it") functions as a central node across groups, teachers should prioritize fostering students' global positive appraisal of English learning rather than focusing solely on isolated activities. Designing meaningful, autonomy-supportive, and competence-enhancing tasks may strengthen this core enjoyment hub and promote positive emotional spillover across dimensions. Second, as teacher-related factors (e.g., friendliness and support) play central and bridging roles-especially for English majors-teachers should cultivate warm, responsive, and supportive classroom relationships. Interpersonal immediacy and consistent encouragement may enhance emotional integration within the enjoyment network. Third, to reduce boredom, targeted interventions should address central and bridge nodes. For English majors, optimizing classroom pacing and increasing engagement may prevent the spread of time-dragging perceptions. For non-English majors, reducing exercise monotony and diversifying task formats (e.g., interactive, multimodal activities) may effectively curb the generalization of boredom and sustain motivational vitality.

5.4. Limitations and recommendations

This study has several limitations. First, the stability coefficient of the English-major network was relatively low, suggesting that centrality estimates should be interpreted cautiously. This instability may be attributed to the limited sample size in the English-major group. Future research should increase sample size to enhance network robustness and replicability. Second, non-English majors were treated as a single group without further disciplinary differentiation. Given that students from different academic fields (e.g., science vs. humanities) may experience emotions differently, future studies should adopt a more fine-grained classification to examine potential discipline-specific variations in FLE and FLLB network structures.

6. Conclusion

In conclusion, this study demonstrated that the network structures of both FLE and FLLB were largely comparable between English majors and non-English majors, supporting the structural robustness of these emotional systems across academic backgrounds. While global configurations were similar, centrality and bridge analyses revealed subtle group-specific emotional transmission mechanisms. Enjoyment was primarily organized around global learning appraisal and teacher-related factors, whereas boredom centered on engagement and task repetitiveness. These findings highlight the value of a micro-level network approach in uncovering nuanced emotional dynamics and provide a more fine-grained understanding of how positive and negative emotions are organized within different learner groups.

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