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The interplay among self-assessment, using reflection for assessment, classroom enjoyment, and immunity: into prospects of effective language learning

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Abstract

Self-assessment and reflective thinking (RT) can arm learners to monitor and evaluate their learning progress. Despite the long history of the core of self-assessment (CSA) and RT, little is known about how they may contribute to learner enjoyment (LE) and learner immunity (LI). Therefore, the current research attempted to propose a model to depict the interplay among CSA, RT, LE, and LI. To this end, the Core of Self-Assessment Questionnaire (CSAQ), Reflective Thinking Questionnaire (RTQ), Foreign Language Enjoyment Scale (FLES), and Language Student Immunity Instrument (LSIS) were administered to 518 Iranian EFL university students. The results of confirmatory factor analysis (CFA) and structural equation modeling (SEM) indicated that EFL university students with higher levels of CSA and RT skills experienced more enjoyment and were immunized productively. Furthermore, the critical role of RT in CSA was discovered. The implications of this study may unveil new prospects for implementing learning-oriented assessment in the classroom and RT practices in educational programs.

Keywords: Self-assessment, Reflective thinking, Learner enjoyment, Learner immunity, EFL university learners

Introduction

Teaching is not a one-way street. It is not merely the process of unidirectional input providing, but the learners should be involved in all class activities and their own self-assessment. Successful language learners developed self-assessment strategies and are involved in dynamic assessments of themselves (Tavousi & Pour Sales, 2018). In GuoJie's words (GuoJie, 2021), CSA is an integrated personality structure that aids learners to develop their own unique, individual pathways to success. The major principle of CSA is to activate the students to observe, practice, monitor, evaluate, and correct themselves (Zhuoyuan, 2021). Furthermore, it is evident that CSA increases students' L2 grit, the management of foreign language anxiety, autonomy, and social relationships (Heydarnead et al., 2022b; Wongdaeng, 2022). More importantly, CSA promotes a sense of individuality and an inner sense of personal worth.

To implement CSA, empowering learners with higher-order thinking skills is strongly suggested (Amirian et al., 2022; Heydarnejad, Abdel-Al Ibrahim, et al., 2022). RT is a problem-solving tool and enables learners to stop, step back, think deeply, measure, analyze, synthesize, and make thoughtful decisions (Aliakbari et al., 2020; Namaziandost, Heydarnejad, & Rezai, 2022). As a zoom lens strategy for taking a deeper look at assessment, RT calls learners' attention, and they gain an appreciation for the cognitive and affective window of language learning and assessment (Ayoobiyan & Rashidi, 2021; Shirazizadeh et al., 2019; Syairofi et al., 2022). Implementing RT in classes requires more investment and attention, especially in the domain of language learning (Davoudi & Heydarnejad, 2020). In other words, RT assists language learners to become competent to take control of their own learning.

LE is an essential attribution that reflects learners' experiencing enjoyment in language learning (Jiang & Dewaele, 2019; Rezai et al., 2022). LE motivates students to act enthusiastically and formulates their emotional resiliency (Kim & Kim, 2016). LE is closely related to that of fostering a sense of performance and a precursor of it (Amerstorfer & Freiin von Münster-Kistner, 2021; Xu et al., 2022). Thus, instilling a positive learning atmosphere and practicing helpful strategies are necessary for effective language learning. That is, in a successful learning environment, teachers are suggested to establish a climate where LE is built up and where class activities and assessments lead to learners' feelings of enjoyment.

Another important construct is LI, which immunized students against problems and difficulties in the realm of education (Hiver & Dörnyei, 2017). LI is similar to a defensive mechanism and acts against high-intensity chaos and complexities of educational settings. This construct, LI, is rooted in psychology and sociology (Hiver, 2017). From a psychological perspective, it affects students' thoughts, feelings, and behaviors. From a sociological perspective, it formulates the ways students interact and behave in the learning environment (Attaran et al., 2018). More precisely, immunity in its productive form is vital for individuals' well-being and functions as an armor against stress, failure, burnout, anxiety, and other negative conflicts (Namaziandost, Heydarnejad, & Rezai, 2022). So far, very little has been carried out in the area of CSA, RT, LE, and LI. There is a wide scope for a considerable amount of research in this area, but to the best of the researcher's knowledge, no study has ever been conducted to uncover the relationships between CSA, RT, LE, and LI, particularly in an EFL context. The findings of this study may provide considerable scope for arriving at a better understanding of CSA, RT, LE, LI, and their contributions to language instruction and assessment.

Literature review

The core of self-assessment (CSA)

The notion of assessment refers to all systematic methods or tools applied to evaluate and document the learners' progress (Bachman, 2015). Among all forms of assessment, CSA is a kind of assessment that activates learners to monitor and evaluate their learning processes. As Bachman et al. (2010) puts it, CSA is "the assessment or evaluation of oneself or one's actions, attitudes, or performance. That is why each learner should be encouraged and trained to go through a process of self-assessment" (p. 12). The main premises of CSA are critical thinking, monitoring, metacognition, and self-regulated

learning (Andrade, 2019; Parveen et al., 2022). Thus, learners who are good at critical thinking, monitoring, metacognition, and self-regulated learning achieve a high level of CSA. In a similar vein, Judge et al. (1997) viewed self-esteem, generalized self-efficacy, neuroticism, and locus of control are the key aspects of CSA.

External factors (i.e., grades and teacher feedback) and internal factors (i.e., such as learners' goal setting) can change the tone and direction of CSA (Bourke & Mentis, 2007). Additionally, students' self-concept, self-identity, and sociocultural background are critical in the depth of students' attitudes toward CSA (Bourke & Mentis, 2007, 2013). As the previous studies pinpointed, investment in boosting CSA strategies among EFL learners influenced their academic well-being (Bijani et al., 2022; Heydarnejad, Ismail, et al., 2022; Punpromthada et al., 2022). According to Al-Mamoory and Abathar Witwit (2021), the more learners practice CSA, the better they can decide reflectively. Thus, self-assessment empowers learners to perform better in the face of problems and difficulties. It was also documented that CSA helps learners to monitor and regulate their emotions (Hu, 2022).

By the same token, Jahara et al. (2022) concluded that EFL students' stress and CSA alter due to coping style strategies that the learners may apply. It was also found that the level of self-assessment depends on the learners' cognitive and metacognitive skills (Nemati et al., 2021; Wei, 2020). It means higher-order thinking tendencies would assist learners to be more successful in their self-assessment. Furthermore, Erez and Judge (2001) concluded that CSA is associated with task motivation. The design of the task and the level of its difficulty may affect students' involvement in CSA. In a recent study by Heydarnejad, Ismail, et al. (2022), a model was suggested to depict the relationship between L2 grit, CSA, and foreign language learning anxiety among EFL learners. Based on their findings, L2 grit acts as a mediator in improving learners' CSA and decreasing foreign language learning anxiety.

Reflective thinking (RT)

RT is referred to as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the conclusion to which it tends" (Dewey, 1933, p.9). According to Dewey (1933), RT is a dynamic process of thinking, questioning, analyzing, and synthesizing. Moreover, Loughran (1996) noted that RT involves reasoning, hypothesizing, problem-solving, and answering. Likewise, Atay (2003) describes RT as the outcome of "remembering, thinking over and assessing with a particular purpose of any experience" (p. 54). Furthermore, Malmir and Mohammadi (2018) stipulated that RT and critical thinking are related; they both take individuals away from routine behavior.

To clarify the meaning of RT, Mezirow (1998) introduced a model of RT including four dimensions: habitual action, understanding, reflection, and critical reflection. Habitual action refers to performing an action regularly and habitually with no or little conscious thinking. Understanding is related to learning based on other experiences. The fourth stage, reflection, refers to active, attentive, and mindful consideration of any situation. To show the importance of this stage, Mezirow (1991) named this stage as validity testing. RT is the highest level of this model, which indicates deeper, more thoughtful, and more profound reflection (Mezirow, 1998). From another perspective, Mezirow (1998)

defined two levels of reflective action: the lower or less critical level and the higher and more critical level. The second level, a higher and more critical level of reflection, is the basis of deep learning and successful achievement in learners' assessments (Ali et al., 2022; Namaziandost, Heydarnejad, Rahmani Doqaruni, & Aziai, 2022; Schön, 1983).

The review of existing literature on RT mirrors the significant contributions of RT in education. For instance, Porntaweeku et al. (2016) found that the strategies involved in RT foster worthwhile learning outcomes. In another survey, Karimi et al. (2022) attempted to picture the effectiveness of RT in improving metacognition awareness and enhancing reading comprehension, accordingly. To this end, a quasi-experimental design was applied, and 63 EFL learners were divided into experimental and control groups. The results of MANOVA indicated that the students in the experimental group outperformed their peers in the control group due to applying RT strategies in their classes. They also concluded that RT was influential in learners' assessment. Taking a similar path, Davoudi and Heydarnejad (2020) explored the role of RT on learners' academic achievement in a cross-contextual analysis. Based on their findings, students in MA adapted reflection and critical reflection and thus were more successful than students in BA, who used habitual action and understanding. Furthermore, Namaziandost, Heydarnejad, and Rezai (2022) provide evidence that RT which is a key factor in reflective teaching leads to teachers' productive immunity and emotion regulation.

Learner enjoyment (LE)

Enjoyment is defined in positive psychology as a representative of the feeling aroused due to a successful accomplishment (Pekrun, 2006). Enjoyment is a multidimensional construct with five mechanisms: emotional, intellectual, motivational, communicative, and physical (Elahi Shirvan et al., 2020). The emotional dimension of enjoyment refers to the pleasant feeling of learners due to positive experiences in language classes. The intellectual aspect defines the constructive appraisal of language learning experiences. Enjoyment also affects learners' attitudes toward learning (motivation), their social relationships with peers and teachers, and the physical health (Heydarnejad, Abdel-Al Ibrahim, et al., 2022; Linnenbrink-Garcia & Pekrun, 2011; Oades-Sese et al., 2011). From another perspective, Seligman (2018) stresses that positive emotion, engagement, relationships, meaning, and achievement are the building blocks of well-being in his PERMA model.

Enjoyment is by nature a dynamic construct. In this regard, Dewaele et al. (2018) confirmed that language LE changes over time depending on the language learners' personality and educational environment. Likewise, Li et al. (2018) concluded that enjoyment and anxiety are dominant in the language classroom and influence the in-class and final products of the learners. It is shown in the literature that teacher-student intercommunications play an important part in promoting LE in the classroom (e.g., Deng et al., 2022; Elahi Shirvan et al., 2020; Elahi Shirvan & Taherian, 2020). Class enjoyment is also inspired by the balance between context-oriented attributes and learners' mental necessities (Chen et al., 2021).

There is a growing body of evidence to indicate that LE is closely linked to positive learner-attributed constructs. As an example, Jin and Zhang (2018) carried out a study in an EFL context and evinced that LE and academic achievement are correlated. In a

similar vein, the findings of Khajavy et al. (2018) show that students with high levels of enjoyment are more willing to speak up and communicate in the classroom. Additionally, Zeng (2021) wrote a review paper to display foreign language enjoyment and engagement. They confirmed that LE increases learners' engagement and academic motivation, thus guaranteeing learners' prolonged accomplishment. Furthermore, Elahi Shirvan and Taherian (2021) conducted a longitudinal study among EFL university students to probe into the association between LE and foreign language classroom anxiety. The findings displayed that LE and foreign language classroom anxiety are negatively correlated. Taking a similar path, Zheng, Heydarnejad, and Aberash (2022) provide evidence that learners' enjoyment progresses dynamically in project-based collaborative writing. They showed that group work decreases learners' anxiety and increases their enjoyment.

Learner immunity (LI)

Immunity is a newborn concept in the realm of education. It addresses the defensive mechanism that is adopted by an individual to overcome undesirable and detrimental effects of educational experiences (Hiver & Dörnyei, 2017). Similar to biological immunity, learner immunity can act productively or mal-productively (Hiver & Dörnyei, 2017; Namaziandost, Heydarnejad, & Rezai, 2022). Productive immunity is a shield against unpleasant emotions, anxiety, fear, and challenges, whereas mal-adaptive immunity is the offspring of the learners' inability to adapt to innovation or change as well as malfunctioning of self-regulatory strategies (Bullough & Hall-Kenyon, 2011; Li et al., 2022). The idea of immunity in the educational system is reinforced by the self-organization theory that is stemmed from the complexity theory (Larsen-Freeman, 2012). Self-organization theory views individuals may adopt an adaptive strategy to alter the internal mechanism as an answer to external challenges to ensure survival (Rahmati et al., 2019).

To stipulate the function of immunity, Hiver (2015a, 2015b) proposed four dimensions for language teacher immunity: productively immunized, maladaptively immunized, immunocompromised, and partially immunized. Productive immunized teachers develop an efficient form of immunity, which helps them defeat all encountering chaos and complexity. Maladaptively, immunization is the result of the counterproductive function of teacher immunity. The third dimension, immunocompromised is the state of incomplete and not fully developed formulation of teacher immunity. Lastly, partial immunization means a halfway state of teacher immunity. The studies conducted in the domain of immunity witness the significant contributions of teacher immunity to other teacher-related constructs. As an example, HaseliSonghori et al. (2018) set forth a study to determine the dominant immunity among EFL teachers. They found that Iranian EFL teachers mostly experience maladaptive immunity. Based on their findings, EFL teachers applied triggering, coupling, realignment, and stabilization in immunity development. In the same vein, Rahimpour et al. (2020) proposed a model to define the elements that predict language teacher immunity. They concluded that agreeableness, extroversion, and emotionality affect the direction of immunity.

In the realm of LI, the research gap is quite identical, and its correlation was not brought to the surface of research. Attaran et al. (2018) attempted to determine the immunology of language learners. They assert that LI is an educational, social, and

psychological system that empowers learners to act against problems and difficulties. They further designed a model to picture language learner immunity. This model entails three procedures: threat recognition, response generation, and self-regulation. The first step, the threat procedure, is organized by the self-evaluation of individuals and situation evaluation. That is, different definitions that learners have about events, challenges, and threats are critical in the construction and reconstruction of their behavior. Thus, subjective evaluations of an experience change the direction and magnitudes of developed immunity among the learners. The next step, the response generation, is the actualization of the learners' responses. Finally, the self-regulation procedure leads to a balanced learners' adaptation to every challenge (Attaran et al., 2018).

Objectives of the present study

The existing literature highlighted the pivotal role of CSA and RT in helping students in general and language learners in particular. CSA and RT are potentially embraced with lots of student-attributed constructs that will be enhanced by clear specifications and continuous feedback. Furthermore, a wide variety of studies support the effectiveness of LI and LE in the process and final product of students. Despite the present evidence for the contributions of CSA, RT, LI, and LE, no study has ever focused on specifying the extent and direction of the relationship among them and the impacts on language learning. Accordingly, this study sets forth to propose a model to specify the association between CSA, RT, LI, and LE (see Fig. 1). Moreover, the direction of this relationship was also determined. The findings of this investigation may open new windows for educational researchers and theorists. It may also help policymakers, language planners, curriculum designers, language teachers, and learners. To capture the abovementioned objectives, the following research questions were the target of this study:

- RQ1: To what extent does EFL university learners' CSA influence their LE?
- RQ2: To what extent does EFL university learners' CSA influence their LI?
- RQ3: To what extent does EFL university learners' RT influence their LE?
- RQ4: To what extent does EFL university learners' RT influence their LI?

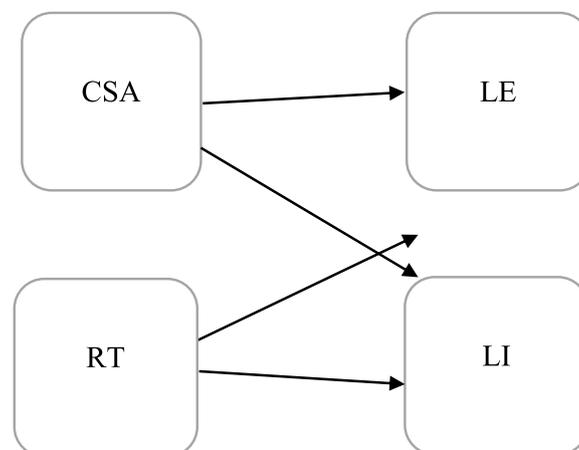


Fig. 1 Theoretical structural equation model

To this end, the following null hypotheses were developed:

- H01: EFL university learners' CSA does not influence their LE.
- H02: EFL university learners' CSA does not affect their LI.
- H03: EFL university learners' RT does not affect their LE.
- H04: EFL university learners' RT does not influence their LI.

Methodology

Participants

The participants of this study were 518 university students, who were studying English teaching ($n = 266$) and English literature ($n = 252$) at the BA level in different universities in Iran. Convenience or opportunity sampling procedures were used as the criteria for selecting the participants. Among 518 participants, there were 216 males and 302 females.

Instruments

The Core of Self-Assessment Questionnaire (CSAQ)

This questionnaire was used to explore the level of the participants' CSA. It was developed by Judge et al. (2003) in 12 items (e.g., "I complete tasks successfully") on a 5-point Likert scale: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). The range of scores in this questionnaire is from 12 to 60. That is, high scores indicate a high level of self-assessment, and low scores show a low level of self-assessment. In the present study, the reliability of the CSAQ was assessed, and it was acceptable ($\alpha = 0.881$).

Reflective Thinking Questionnaire (RTQ)

The state of learners' applying reflection on assessment was inspected via RTQ designed and validated by Kember et al. (2000). The RTQ involves 16 items on a 7-point Likert scale measuring four dimensions of habitual action (e.g., "When I am working on some activities, I can do them without thinking about what I am doing"), understanding (e.g., "I need to understand the material taught by the teacher to perform practical tasks"), reflection (e.g., "I often re-appraise my experience so I can learn from it and improve for my next performance"), and critical reflection (e.g., "As a result of this course I have changed the way I look at myself"). In the current investigation, the report of Cronbach was 0.879, which indicated acceptable reliability.

Foreign Language Enjoyment Scale (FLES)

University learners' enjoyment was examined through FLES, developed and validated by Dewaele and MacIntyre (2016). FLES contains 21 items (e.g., "There is a positive environment in my FL class.") on a 5-point Likert scale (ranging from strongly disagree to strongly agree). Based on the report of Cronbach's alpha ($\alpha = 0.899$), the reliability of FLES in this study was acceptable.

Language Student Immunity Instrument (LSIS)

To gauge the participants' immunity, the Language Teacher Immunity Instrument designed and validated by Hiver (2017) was modified by the researchers of this study. The Language Teacher Immunity Instrument includes 39 items in seven subscales on a 6-point Likert scale: teaching self-efficacy (7 items), burnout (5 items), resilience (5 items), attitudes toward teaching (5 items), openness to change (6 items), classroom affectivity (6 items), and coping (5 items). The modified version, the Language Student Immunity Instrument (LSIS), entails seven subscales in 39 items on a 6-point Likert scale ranging from 1 (= strongly disagree) to 6 (= strongly agree). The subscales in LSIS were as follows: learning self-efficacy (e.g., "I feel I can positively influence my own life by thinking more deeply about educational conflicts") (7 items), burnout (e.g., "There are days at school when I feel vulnerable") (5 items), resilience (e.g., "Failures double my motivation to succeed as a learner") (5 items), attitudes toward learning (e.g., "Learning is my life and I can't imagine giving it up") (5 items), openness to change (e.g., "I get frustrated when my activities are unfamiliar and outside my comfort zone as a learner") (6 items), classroom affectivity (e.g., "Overall, I expect more good things to happen to me in the classroom than bad") (6 items), and coping (e.g., "When things get really stressful, I try to come up with a strategy about what to do") (5 items). The reliability of LSIS was estimated, and the result of the Cronbach alpha coefficient was ($\alpha = 0.873$) acceptable.

Procedures

The current research was conducted via a web-based platform, and the data were collected during 3 months (from July to September) in 2022. An electronic survey form including CSAQ, RTQ, FLES, and LSIS was administered to the participants via Google Forms. All in all, 518 forms were collected, and the return rate was 83.6%. This electronic survey was designed in a way that all parts should be linked necessarily; thus, no data were missed. Electronic surveys provide this significant opportunity that the data can be gathered from different regions with different sociocultural backgrounds and age groups.

Data analysis

To analyze the data, the normal distribution of the data was inspected through Kolmogorov-Smirnov test. The results indicated that the data were normally distributed; thus, parametric methods were employed for data analysis. Thereby, CFA and SEM using LISREL 8.80 were used. CFA was applied to validate the latent variables (Hair et al., 1998). Moreover, SEM was utilized to take a confirmatory hypothesis-testing approach for the proposed structural theory (Schreiber et al., 2006).

Results

In this section, the outcomes of applied statistical analysis are presented to show the connection found between CSA, RT, LE, and LI. Firstly, the descriptive statistics were summarized in Table 1.

As Table 1 displayed, the computed mean score of CSA was $M = 40.490$ ($SD = 9.918$). In the second sub-scale, RT, reflection ($M = 15.934$, $SD = 5.017$) got the

Table 1 Descriptive statistics

Instruments	N	Minimum	Maximum	Mean	Std. deviation
The Core of Self-Assessment Questionnaire (CSAQ)	518	13	60	40.490	9.918
Habitual action	518	4	28	14.297	5.337
Understanding	518	4	28	15.143	5.125
Reflection	518	4	28	15.934	5.017
Critical reflection	518	4	28	14.589	5.240
Reflective Thinking Questionnaire (RTQ)	518	16	112	59.963	18.956
Learning self-efficacy	518	7	42	26.060	9.293
Burnout	518	5	30	19.232	6.877
Resilience	518	5	30	19.046	6.807
Attitudes toward learning	518	5	30	19.571	6.534
Openness to change	518	7	36	22.844	7.858
Classroom affectivity	518	6	36	21.973	8.895
Coping	518	5	30	19.108	6.627
Language Student Immunity Instrument (LSII)	518	48	234	147.834	47.474
Foreign Language Enjoyment Scale (FLES)	518	24	105	75.952	19.307

Table 2 The results of Kolmogorov-Smirnov test

Instruments	Kolmogorov-Smirnov Z	Asymp. sig. (2-tailed)
The Core of Self-Assessment Questionnaire (CSAQ)	0.916	0.371
Habitual action	1.271	0.079
Understanding	1.039	0.230
Reflection	1.073	0.200
Critical reflection	1.197	0.114
Reflective Thinking Questionnaire (RTQ)	1.379	0.055
Learning self-efficacy	0.916	0.371
Burnout	0.853	0.461
Resilience	0.995	0.276
Attitudes toward learning	0.822	0.510
Openness to change	0.995	0.275
Classroom affectivity	0.694	0.721
Coping	0.738	0.648
Language Student Immunity Instrument (LSII)	1.372	0.056
Foreign Language Enjoyment Scale (FLES)	0.598	0.867

highest mean score. Moreover, among the components of LSII, learning self-efficacy ($M = 26.060$, $SD = 9.293$) and openness to change ($M = 22.844$, $SD = 7.858$) presented the highest mean scores. Considering FLE, the mean score was $M = 75.952$ ($SD = 19.307$).

Then, to decide on efficient statistical analysis, the Kolmogorov-Smirnov test was utilized to examine the normal descriptions of the data. The report of the Kolmogorov-Smirnov test is presented in Table 2.

Table 2 shows that the sig. values for all the instruments and their subscales were higher than 0.05. This means that the data were normally distributed, and parametric methods can be used to analyze the data. Hence, the structural relationships among

CSA, RT, LI, and LE were examined via the LISREL 8.80 statistical package. To assess the model fit, the chi-square magnitude, the root-mean-squared error of approximation (RMSEA), the comparative fit index (CFI), and the normed fit index (NFI) were applied. The chi-square/df ratio should be lower than 3, and the chi-square should be non-significant (Jöreskog, 1990). The range of the root means the square error of approximation (RMSEA) is considered to be lower than 0.1 (Jöreskog, 1990). Additionally, the cut values for the NFI, GFI, and CFI are suggested to be greater than 0.90 (Jöreskog, 1990).

According to Table 3, the chi-square/df ratio (2.901), the RMSEA (0.061), GFI (0.932), NFI (0.924), and CFI (0.946) reached the acceptable fit thresholds.

The strengths of the causal relationships among the variables were explored via standardized estimates and *t*-values. Figures 2 and 3 display the effect of CSA and RT on LI and LE. The influence of CSA on LE ($\beta = 0.73$, $t = 22.38$) and LI ($\beta = 0.67$, $t = 19.12$) was statistically and positively significant. The effect of RT on LE ($\beta = 0.81$, $t = 28.50$) and LI ($\beta = 0.88$, $t = 33.01$) was significantly positive.

The following table presented the report of the fit indices in the second model. Based on Table 4, the chi-square/df ratio (2.837) and the RMSEA (0.060) got the acceptable fit thresholds. Moreover, GFI (0.925), NFI (0.912), and CFI (0.941) were acceptable.

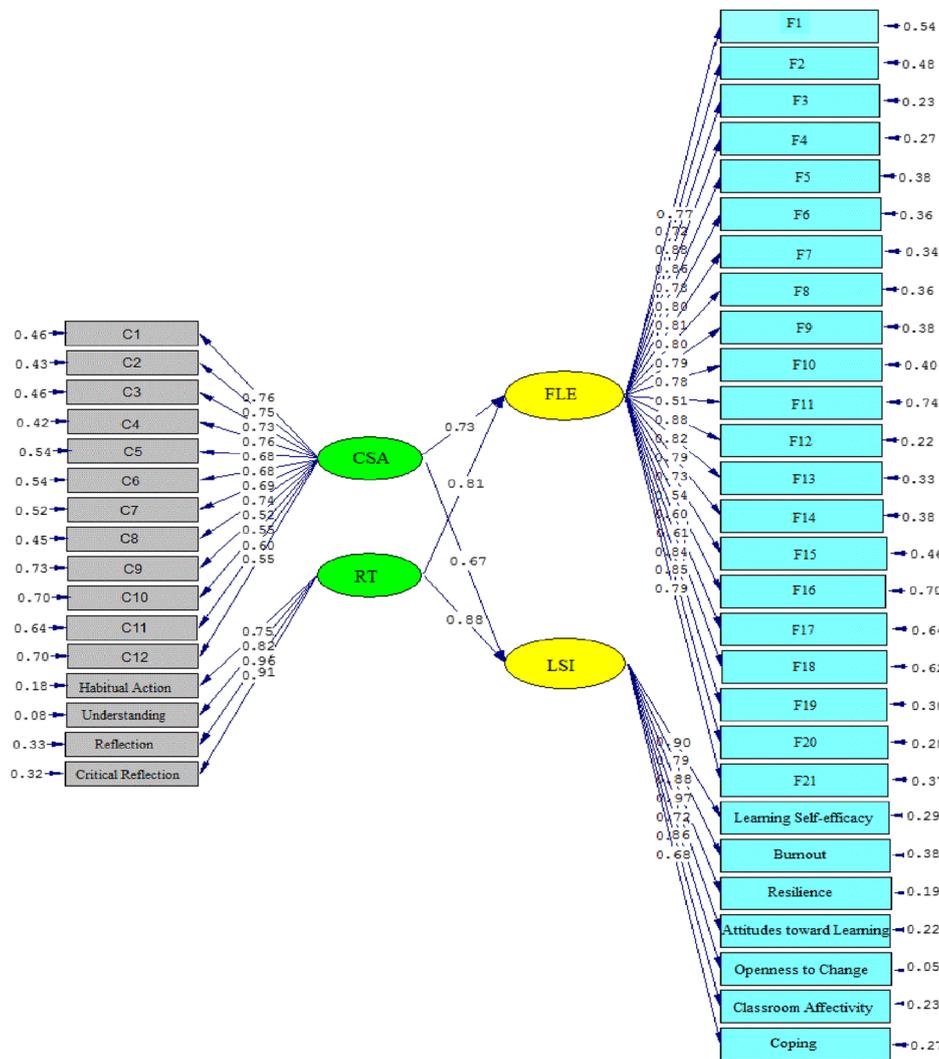
In model 2 (Figs. 4 and 5), the schematic representation of path coefficient values for the association CSA, RT, LE, and LI is presented. Based on these figures, CSA significantly and positively correlated with LE ($\beta = 0.70$, $t = 15.36$) and LI ($\beta = 0.70$, $t = 15.36$). Additionally, the subcomponents of RT correlated significantly and positively with LE: habitual action ($\beta = 0.64$, $t = 18.80$), understanding ($\beta = 0.75$, $t = 27.72$), reflection ($\beta = 0.89$, $t = 36.09$), and critical reflection ($\beta = 0.81$, $t = 32.19$). The relationships between the subcomponents of RT and LI were as follows: habitual action ($\beta = 0.71$, $t = 22.43$), understanding ($\beta = 0.76$, $t = 28.86$), reflection ($\beta = 0.88$, $t = 36.77$), and critical reflection ($\beta = 0.91$, $t = 38.76$).

Following this step, a Pearson product-moment correlation was run to gauge the correlation between CSA, RT, LE, and LI.

According to Table 5, CSA and RT correlated significantly and positively with LE and LI. The correlation is between CSA and LE ($r = 0.756$, $p < 0.01$) and LI ($r = 0.704$, $p < 0.01$). Furthermore, the relationships between habitual action and LE ($r = 0.684$, $p < 0.01$), understanding and LE ($r = 0.798$, $p < 0.01$), reflection and LE ($r = 0.914$, $p < 0.01$), and critical reflection and LE ($r = 0.844$, $p < 0.01$) were significantly positive. Regarding the association between the subcomponents of RT and LI, the results were as follows: habitual action and LI ($r = 0.787$, $p < 0.01$), understanding and LI ($r = 0.811$, $p < 0.01$), reflection and LI ($r = 0.905$, $p < 0.01$), and critical reflection and LI ($r = 0.933$, $p < 0.01$).

Table 3 Model fit indices (model 1)

Fitting indexes	χ^2	df	χ^2/df	RMSEA	GFI	NFI	CFI
Cut value			< 3	< 0.1	> 0.9	> 0.9	> 0.9
The first model	2480.51	855	2.901	0.061	0.932	0.924	0.946

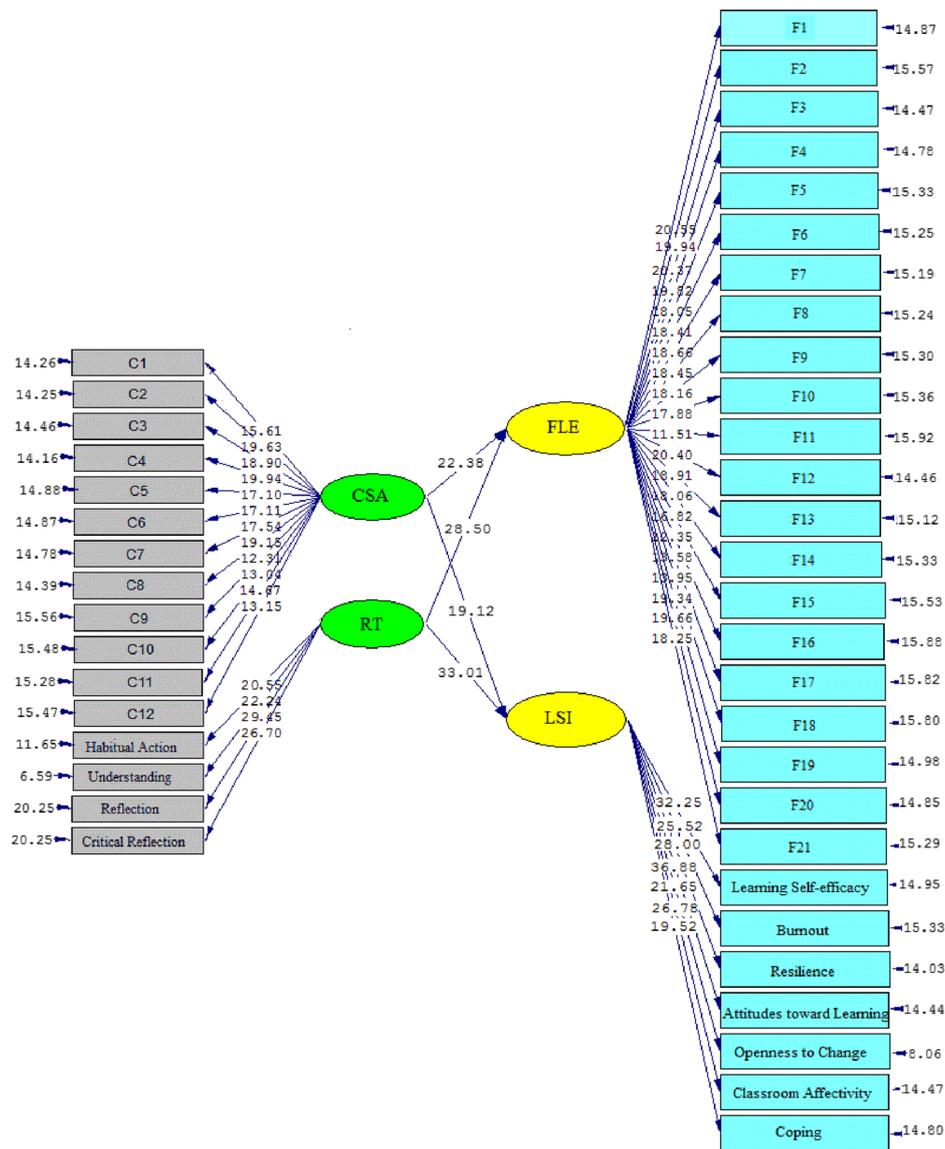


Chi-Square=2480.51, df=855, P-value=0.00000, RMSEA=0.061

Fig. 2 Schematic representation of path coefficient values for the relationships between CSAQ, RTQ, FLES, and LSIS (model 1)

Discussion

The current study aimed at investigating to what extent CSA and RT could predict LE and LI among 518 EFL university students. In this regard, a structural equation modeling approach was utilized to test the causal structural model between the aforementioned constructs and display their reciprocal relationships. Generally, the study findings mirrored that CSA and RT play mediator roles in increasing learners' LE and LI. Thereby, the first null hypothesis (H01: EFL university learners' CSA does not influence their LE) and the second null hypothesis (H02: EFL university learners' CSA does not affect their LI) were rejected. Furthermore, the third null hypothesis (H01: EFL university learners' RT does not affect their LE) and the fourth null hypothesis (H02: EFL university learners' RT does not influence their LI) were not confirmed. It was also found that among the components of RT, reflection got the highest mean



Chi-Square=2480.51, df=855, P-value=0.00000, RMSEA=0.061

Fig. 3 T-values for path coefficient significance (model 1)

Table 4 Model fit indices (model 2)

Fitting indexes	χ^2	df	χ^2/df	RMSEA	GFI	NFI	CFI
Cut value			< 3	< 0.1	> 0.9	> 0.9	> 0.9
The second model	4153.12	1464	2.837	0.060	0.925	0.912	0.941

score. In addition, learning self-efficacy and openness to change were the most endorsed components among the subscales of LSII. It can be inferred that investment in CSA and reflection flourish the healthy state of LE and LI. Furthermore, the reciprocal relationships between CSA and RT can be implied from the study findings.

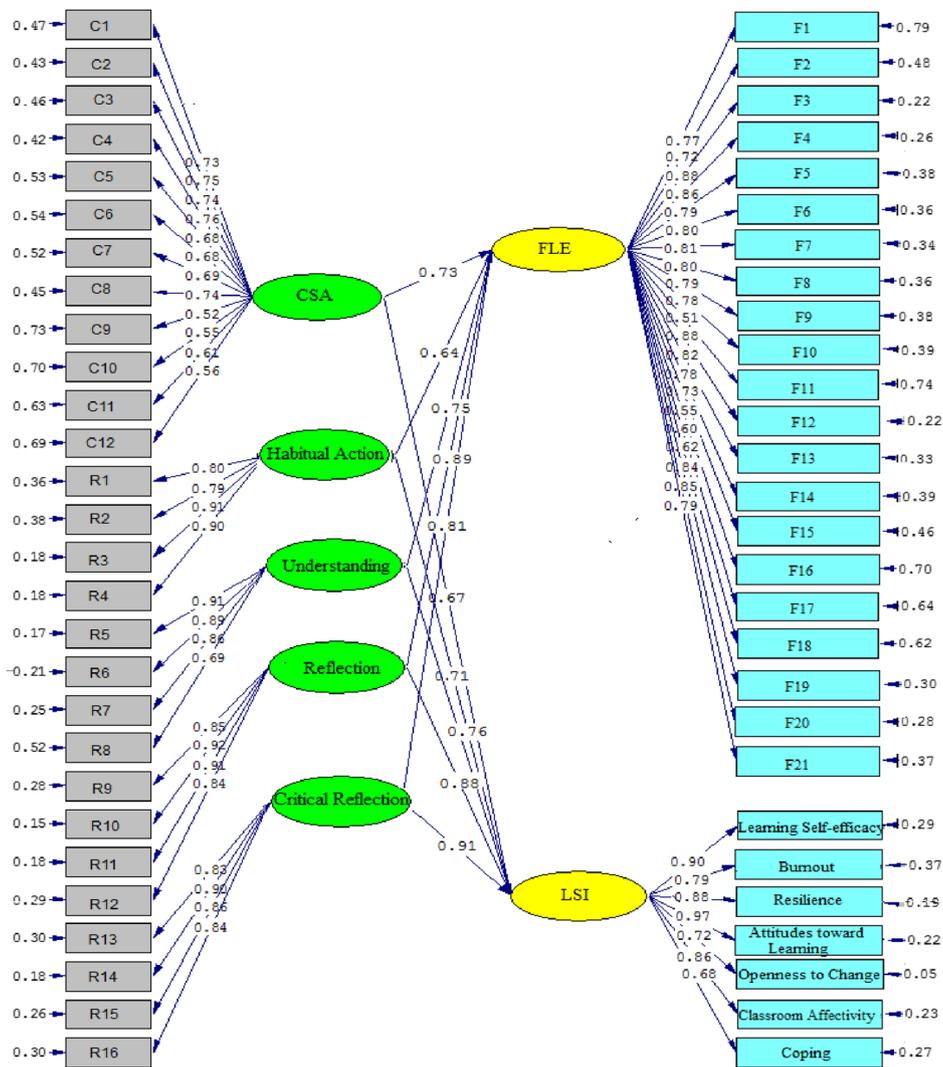
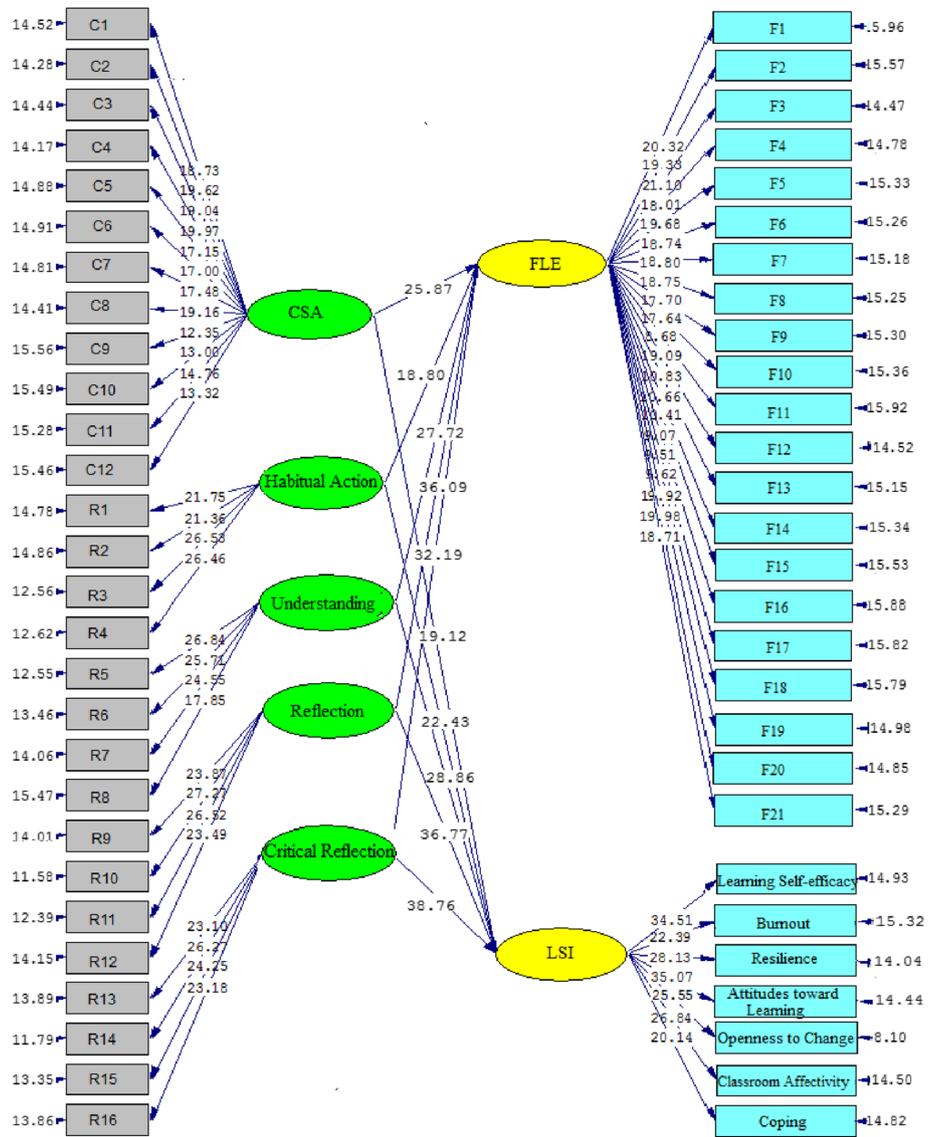


Fig. 4 Schematic representation of path coefficient values for the relationships between CSAQ, RTQ, FLES, and LSI subscales (model 2)

Thus, EFL university learners’ deep-rooted thinking and self-assessment will pervade their classroom actions. In other words, RT lies at the core of self-assessment.

Regarding the first research question (RQ1: To what extent does EFL university learners’ CSA influence their LE?), the results indicated that a high state of CSA could predict high levels of LE (model 1). It means that when EFL university learners feel a positive self-concept and are active in their own assessment, they feel more enjoyment. It can be highlighted that CSA imparts learners from being passive in their learning; rather, they are actively involved in making sense of the learning tasks and assessments. This state of learning would contribute to both initiating and sustaining engagement. It can be inferred that language teachers need to arouse their learners’ self-awareness and self-assessment by designing tasks and activities to build up a sense of agency, mastery, and self-confidence (model 2). It should be noted, however, research in the realm of CSA and



Chi-Square=4153.12, df=1464, P-value=0.00000, RMSEA=0.060

Fig. 5 T-values for path coefficient significance (model 2)

Table 5 The correlation coefficients between CSAQ, RTQ, FLES, and LSIS subscales

	CSA	Habitual action	Understanding	Reflection	Critical reflection	FLE	LSI
CSA	1						
Habitual action	0.523 ^a	1					
Understanding	0.586 ^a	0.489 ^a	1				
Reflection	0.622 ^a	0.512 ^a	0.517 ^a	1			
Critical reflection	0.587 ^a	0.606 ^a	0.631 ^a	0.534 ^a	1		
FLE	0.756 ^a	0.684 ^a	0.798 ^a	0.914 ^a	0.844 ^a	1	
LSI	0.704 ^a	0.787 ^a	0.811 ^a	0.905 ^a	0.933 ^a	0.594 ^a	1

^a Correlation is significant at the 0.01 level (2-tailed)

LE is quite rare and needs more attention (Andrade, 2019). The finding of Heydarnejad, Ismail, et al. (2022) confirmed the influence of L2 grit on CSA and controlling EFL learners' anxiety in the classroom. The effects of L2 grit on boosting self-efficacy and emotion regulation are approved by Zheng, Yu, and Tong (2022). This can be inferred that CSA directed both the cognitive and emotional states of the learners. When learners feel less anxiety and anger, academic motivation and engagement increase; thus, academic achievement is supported.

The findings about the second research question (RQ2: To what extent does EFL university learners' CSA influence their LI?) showed that CSA influenced immunity among EFL university learners (model 1). That is, learner-oriented ways of assessment lead to productive immunizations of the learners. If learners constantly are involved in their own assessment, they can find their pitfalls more deeply and help teachers to decide much better about the rest of the educational programs. Based on the findings (model 2), CSA played a mediator role in the subscales of LI (i.e., learning self-efficacy, burn-out, resilience, attitudes toward learning, openness to change, classroom affectivity, and coping). The result is supported by the findings of Huang (2022) as well as Gorjinpour and Barzegar (2022). They concluded that self-assessment is pivotal in individuals' self-efficacy and self-concept. Heydarnejad, Abdel-Al Ibrahim, et al. (2022) highlighted that academic emotion regulation is pivotal in EFL students' self-assessment. At the broadest level, it was approved that individual' reflective thinking has a profound influence on the development of emotion regulation and productive immunity (Namaziandost, Heydarnejad, Rahmani Doqaruni, & Aziai, 2022). What makes the immunity mechanism works productively, therefore, lies in terms of self-awareness and self-assessment.

Considering the third research question (To what extent does EFL university learners' RT influence their LE), the efficacy of RT in enhancing LE was found. It means that the ability and effort to think deeply and analyze the experiences arise from innate drives in learners (model 1). This finding is in accord with Deng et al. who found that self-monitoring as an attribution of higher-order thinking skills leads to individuals' engagement and self-efficacy. In the same vein, Keleynikov et al. (2022) highlighted that teachers' mindfulness and thinking strategies were the key factors in their enjoyment and management of psychological distress. As the results display, the more EFL learners lie on cognitive and metacognitive strategies of thinking skills the better they can perform in-class activities and assessments (model 2). Consequently, feelings of accomplishment increase their academic enjoyment and self-confidence. Theoretically, it can be argued that higher-order thinking tendencies will change the outlooks of the learner and their goal orientation (Kember et al., 2000). The basic premise of RT is that learners should make sense of their learning. They should identify their own strengths and develop their own self-knowledge via self-assessment. The underpinning principles of CSA and positive psychology argue that students with positive self-assessments feel positive about themselves (Judge et al., 2003; Macintyre et al., 2019). They are more likely to set themselves more optimistic goals and to engage in situations that involve risks.

The last research question addressed (RQ4: To what extent does EFL university learners' RT influence their LI) the impact of RT on LI. The outcome reflected that RT improved EFL learners' productive immunity (Model 1). Those EFL university students who evade habitual actions and practice reflection and critical reflection are

more successful in learning self-efficacy, resilience, attitudes toward learning, openness to change, classroom affectivity, and coping. It was also found that higher levels of RT decrease the probability of burnout experiences among EFL learners (model 2). In other words, RT and critical thinking are associated with self-awareness and self-regulation (Heydarnejad et al., 2021, b; Wang et al., 2021), skillful decisions (Wang et al., 2022), L2 grit, and self-efficacy (Li et al., 2022), which are the factors necessary for achieving productive immunity. Putting it all together, RT can help learners to behave and perform decisively and thoughtfully, especially on their assessment; yet, the reciprocal relationships between RT and LI are quite a shadow and call for more research, especially in the EFL context.

Conclusion and implications

In sum, this investigation documented the predictive power of CSA and RT to LE and LI among EFL university students. The findings mirrored that CSA and RT work as a compass for EFL students and give direction in their learning journey and protect them in the face of learning chaos and complexities. CSA and RT also influence the attitudes of EFL learners toward language learning, assessment, and communication with teachers and peers. In addition, the significant effect of RT on CSA was implied by the study findings.

Some pedagogical implications for educators, especially in the realm of language learning and assessment, are recommended. The related knowledge to implement CSA and RT strategies should be acquired by both language teachers and learners. In this regard, pre-service and in-service teacher training programs are suggested. Language learners, especially students in higher education, need to learn and practice self-assessment and RT strategies; thus, designing materials and tasks with these stand points is highly recommended. Therefore, learners as a reflective practitioners should become central to educational perspectives. A more helpful approach to language teaching and assessment seems to lie within practicing higher-order thinking skills as well as self-assessment in higher education. Teachers and university professors should seek ways of enabling students to take control of their learning and to build up an appropriately positive level of self-assessment, which helps them to become truly autonomous.

Similar to other research in the realm of education, this study suffers from some limitations: Firstly, the current survey is quantitative in nature, and to get a deeper understanding of the causal links between CSA, RT, LE, and LI, future research can apply mixed-method approaches. Secondly, the participants' demographic variables and their possible effects on CSA, RT, LE, and LI were not addressed in this study; therefore, they can be the target of future research. Moreover, the interplay between CSA, RT, LE, and LI was studied among EFL university learners. Further studies are suggested to focus on their possible relationships in other educational contexts. Lastly, this investigation was cross-sectional and may not reflect the extent and depth of CSA and RT influences on LE and LI over a long period of time. In this regard, further longitudinal studies are recommended in the future.

Abbreviations

EFL	English as a foreign language
CSA	Core of self-assessment

CSAQ	Core of Self-Assessment Questionnaire
RT	Reflective thinking
RTQ	Reflective Thinking Questionnaire
LE	Learner enjoyment
FLES	Foreign Language Enjoyment Scale
LI	Learner immunity
LSIS	Language student immunity instrument
SEM	Structural equation modeling
CEA	Confirmatory factor analysis
GFI	Good fit index
LISREL	Linear structural relations
NFI	Normed fit index
RMSEA	Root-mean-square error of approximation

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Authors' contributions

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The authors state that all the data supporting the findings of this study are available within the article.

Declarations

Competing interests

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