

Language learners' emotional dynamics: Insights from a Q methodology intensive single-case study

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Abstract

Learner emotions represent sudden, dynamic, and complex adaptations to the language classroom environment. Recent Second Language Acquisition research calls for a more holistic perspective in approaching classroom emotions, one that considers emotional variations between and across learners, and which foregrounds the interconnections among emotions and between emotions and the learning environment. This paper approaches emotions from a Complex Dynamic Systems perspective and investigates the classroom emotions of five university students of Korean as a foreign language using a Q methodology intensive single-case study design. Overall results show that students have sometimes similar, sometimes different emotional reactions depending on classroom events, indicating different levels of interaction between a learner's emotional system and other individual characteristics. Additionally, a more fine-grained analysis at the level of individual learners reveals clusters of emotions triggered by the same event and foregrounds the relevance of epistemic emotions for instructed foreign language learning. The results are discussed focusing on new hypotheses to inform future SLA emotion research and classroom practices.

Keywords

Learner emotions, classroom environment, epistemic emotions, Q methodology, single-case study, Korean language.

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Disclosure statement

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1. Introduction

Language learners meet myriad challenges and opportunities in their classroom interactions. These complex and dynamic encounters trigger various emotions affecting academic success (Jacob et al., 2019) and the language acquisition process (Saito et al., 2018). This reality is multifaceted, and researchers are calling for a holistic stance that considers how emotions are interconnected and adapt to the challenges and opportunities of the learning environment (MacIntyre et al., 2019).

The present research, framed in a Complex Dynamic Systems Theory perspective (CDST) (Larsen-Freeman, 1997), focuses on exploring learner emotions in interaction with a limited but representative number of language classroom events using a Q methodology intensive single-case study design. The single case study, an approach centered on the individual learner, is best suited to explore the dynamic intersection of emotions and the learning space (Hiver, Al-Hoorie & Evans, 2021). Additionally, although language learner emotions have already been considered from a dynamic perspective, Q methodology can offer alternative insights compared to other approaches. Called "the best-developed paradigm for the investigation of human subjectivity" (Dryzek & Holmes, 2002, p. 20), Q methodology offers the advantage of being "able to capture the uniqueness of the minds of learners" (MacIntyre et al., 2017, p. 112). Furthermore, a Q methodology intensive single-case study, thanks to multiple conditions of instruction, allows the researcher to observe people's behavior from different probing points (Stephenson, 1953), yielding factors complementary to each other and reflecting different aspects of the same reality (Stephenson 1983).

Overall, this paper shows how specific classroom events affect language learner emotions at both intra-individual and inter-individual levels, provides hypotheses for future research regarding different learner emotional reactions in front of similar circumstances and also regarding the role of epistemic emotions, and shows how the Q methodology intensive single-case study design can be applied to research into the psychology of language learning.

2. Literature review

2.1. Current SLA research and learner emotions

Extensive research conducted on Foreign Language Anxiety (FLA) (Horwitz, 1986) contributed to raising consciousness on the role of emotions in SLA. Nevertheless, researchers understood that a negative focus provided only a partial understanding of the relationship between language learning and emotions. The influence of Positive Psychology prompted the

field to consider other emotions and foregrounded the importance of adopting a strength-based approach (MacIntyre et al., 2019). Subsequent research demonstrated that positive and negative emotions, although independent, can be experienced together in the foreign language classroom (Dewaele & MacIntyre, 2014; 2016).

Meanwhile, the educational field has started accounting for epistemic emotions, for example surprise, curiosity, confusion, frustration, and boredom (Chevrier et al., 2019). Epistemic emotions "result from information-oriented appraisals [...] about the alignment or misalignment between new information and existing beliefs, existing knowledge structures, or recently processed information" (Muis et al., 2018, p. 169) and represent affective states whose object focus lies in the generation of knowledge (Vogl et al., 2019). Only a few papers in the SLA field consider epistemic emotions (MacIntyre & Vincze, 2017; Mahmoodzadeh & Khajavy, 2019; Nakamura et al., 2022; Ross & River, 2018); however, these emotions are some of the most common in an academic context (Geerling et al., 2020).

More recently, one of the major theoretical advances has been the acknowledgment that "language learners experience a wide range of interacting positive and negative emotions in an infinite amount of colors and shades" (Dewaele & Pavelescu, 2021, p. 67), which foregrounds the importance of a dynamic and holistic approach. Notwithstanding these conceptual advances, researchers often do not consider more than a few discrete emotions concurrently, and so far the SLA field has given scant consideration to epistemic emotions. However, if emotions are highly dynamic and the presence of one emotion does not indicate the absence of another (Dewaele & Pavelescu, 2021), then research focusing on a few discrete emotions in isolation struggles to represent the learners' emotional system holistically.

2.2. Learner emotions as a complex dynamic system

Given that emotions can be seen as a "self-organizing system constituted by the interaction of many components related to individuals in their social and physical context" (Fogel et al., 1992), Complex Dynamic System Theory (CDST) becomes a helpful framework for understanding learners' emotions. CDST is an interdisciplinary paradigm adopted to study the behavior of entities "produced by a set of components that interact in particular ways to produce some overall state or form at a particular point in time" (Larsen-Freeman & Cameron, 2008, p. 26).

Although CDST has already been applied to the study of language learner individual differences (see Zheng et al., 2020), its application to emotion research is still limited (Gregersen, 2020). Nevertheless, emotions possess many characteristics of dynamic systems. Emotions are complex, resulting from different psycho-physiological components concurrently

in action (Moors et al., 2013), and can coexist in contradiction to each other (Dewaele & MacIntyre, 2014; 2016). Systems are dynamic and change over short timeframes in a non-linear fashion (Larsen-Freeman, 1997; 2019). In this respect, learner emotions show fluctuations on different timescales (Boudreau et al., 2018) and modify each other depending on the interaction of the system's individual components with other systems (Oxford & Gkonou, 2021). Learner emotions respond to changes in the learning context and therefore connect the learners' subjective and social worlds (Hiver, Al-Hoorie & Evans, 2021). This dynamic interaction forms a coherent whole constituting an ever-changing structure of the learner's emotional system components. In other words, individuals and context shape each other, and the environment becomes itself a part of the system (Ushioda, 2020).

2.3. Q methodology and complex dynamic systems theory

Stephenson developed Q methodology as a theoretical framework and a statistical toolset for the in-depth study of subjectivity (Stephenson, 1953). Q methodology is aligned for several aspects with a CDST approach (MacIntyre et al., 2017). CDST, similarly to Q methodology, invites researchers to overcome binary dichotomies (Larsen-Freeman, 2017). Moreover, in a CDST framework, the research goal lies in generating theories and hypotheses (MacIntyre et al., 2021), with Q methodology similarly able to discover new hypotheses and reach a deeper understanding of the issue under investigation (Stephenson, in the foreword to Brown, 1980). CDST has been described as a science of the individual (Al-Hoorie et al., 2021), and research based on a CDST framework benefits from a Q methodological focus on subjectivity.

Q methodology's applications have grown during the past decades (Lundberg et al., 2020), and it has been adopted in SLA research to investigate learner individual variables such as motivation (Caruso & Frascini, 2021; Frascini & Caruso, 2019; Peng & Wu, 2022; Zheng et al., 2019, 2020). Most Q methodology applications involve multiple participants sorting one set of statements, the Q sample, following a single condition of instruction. Some exceptions are studies conducting data collection at two different points in time (Morea, 2022; Irie et al., 2018; Zheng et al., 2020), or studies adopting different Q samples for different conditions of instruction (Lundberg, 2019a; 2019b). Lundberg et al. (2020) noted that the Q methodology intensive single-case study design has not been applied to educational research between 2010 and 2019. This design consists of one participant sorting the same Q sample several times, from as few as three or four up to as many as fifty (as in Mauldin, 2017), each time under a different condition of instruction. Brown (2019, p. 574) noted that the single-case design allows the application of "the penetrating power of factor analysis to the study of individual lives", and

thus represents one of the major strengths of Q methodology. From a CDST perspective, this design, when used with multiple participants, combines both the individual and the group levels of analysis (Hiver, Al-Hoorie & Larsen Freeman, 2021) and therefore allows the researcher to account for intra-individual and inter-individual system variations (Larsen-Freeman, 2015).

2.4. Classroom environment and language learner emotions

Classroom environment is a term encompassing classroom factors that influence learning activities. It has been the focus of educational research for a long time, and numerous tools have been developed to understand learners' psychological perception thereof (Fraser, 1998). Reyes et al. (2012) showed that the emotional interactions that students make in the classroom promote academic achievement, while a negative emotional classroom environment prevents it; therefore, a consideration of the classroom environment is fundamental because of its effects on emotions and learning outcomes (Dorman & Fraser, 2009).

Fraser (1998) and Fraser and Treagust (1986) showed that the classroom environment has been conceptualized in many forms, but the 'What Is Happening in this Class' (WIHIC) (Fraser et al., 1996) scale is probably one of the most popular tools used to assess its perception. This scale theorizes the classroom environment as student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity. Peng and Woodrow (2010) adapted the WIHIC to be used among English language learners in China, conceptualizing the classroom environment as teacher support, student cohesiveness, and task orientation. Later, to study the same educational context, Liu & Fraser (2013) developed a scale including teacher support, task orientation, student cohesiveness, cooperation, and organization.

The relation between classroom environment and emotions has already attracted attention in SLA research. Dewaele and MacIntyre (2014) found that classroom activities and classmates affect learners' enjoyment. Khajavy et al. (2018), in their study of classroom environment, emotions, and WTC, conceptualized the classroom environment as teacher support, student cohesiveness, and task orientation, demonstrating that a positive classroom environment positively affects learners' WTC, fostering enjoyment and lowering anxiety. Li et al. (2021), adopting the scale used by Peng and Woodrow (2010), found that learner external variables such as those of the learning environment predict enjoyment more than learner internal variables such as trait emotional intelligence, further stressing the need for more consideration of the classroom environment in emotion research. Further aspects of the classroom environment so far considered by researchers are teacher-related variables, for example friendliness (Dewaele, 2019), behavior (Dewaele et al., 2022), personality (Ahmadi-

Azad et al., 2020), amount of use of the target language (Fraschini & Tao, 2021), feedback (Lee, 2016), and whether the teacher is an L1 or an L2 speaker (Dewaele, Franco Magdalena, Saito, 2019). Overall, these studies confirmed that interaction with the teacher remarkably influences learners' emotions. Lastly, more recent studies considered the remote teaching environment, noticing that in the online classroom, both positive and negative emotions are often less intense than in the traditional face-to-face class (Resnik & Dewaele, 2021).

3. Research Questions

The present Q methodology study focuses on the emotional system of individual learners in interaction with eight situations representative of the learning environment. The research questions that this study set out to answer are as follows.

RQ1. How do learners react, in terms of emotions, to different events in a foreign language classroom?

RQ2. How are emotions interconnected?

4. Methodology

4.1. Research setting and participants

After receiving Human Ethic Research approval from The University of Western Australia, the researcher recruited volunteers by posting an announcement on the online board of second- and third-year Korean language courses at the same university. Students enrolled in these courses could be considered advanced beginners or intermediate level students. These Korean language courses are part of the Korean Studies (KS) degree major and are also open as elective courses.

Five students expressed interest in the project and contacted the researcher to participate. A description of the project participants is in table 1.

Table 1. Study participants¹

Name	Course	Major/elective	L1	Most used language	Other FL learning experience	Other languages spoken at home
Hayley	3rd year	KS 1 st major	English	English	Yes	No
Alice	3rd year	KS 2 nd major	English	English	Yes	No
Mira	2nd year	KS 2 nd major	English	English	Yes	Yes

¹ All names are pseudonyms.

Julia	3rd year	KS 1 st major	English	English	Yes	No
Ethan	2nd year	Elective	English	English	Yes	Yes

4.3. Research tools

Each participant, following different conditions of instruction, was asked to sort a deck of 30 cards eight times on a grid. The eight conditions of instruction represented different episodes of the language classroom environment, while each card showed a different emotion and corresponded to the Q sample. The Q sample was extracted from a collection of emotions created by consulting SLA and educational psychology research literature. In particular, the emotions considered first were those reported in Fredrickson (2003), MacIntyre and Vincze (2017), Pekrun (2006), Reeve (2018), Muis et al. (2018), and Pekrun and Linnenbrink-Garcia (2014). From the collections of emotions (the concourse in Q methodology), emotions with little relevance to the language classroom or that could significantly overlap were discarded (for example, feeling stressed, which could overlap with anxiety, and triumph, which could overlap with pride). This process produced a Q sample of 27 emotions used for the pilot study.

To draft different conditions of instruction, the researcher considered the conceptualization of the learning environment presented in Kim et al. (2000), Li et al. (2021), Liu and Fraser (2013), and Peng and Woodrow (2010). Seven aspects of the learning environment were deemed adaptable to the typical Korean language classroom under consideration. The researcher drafted a classroom episode representative of each aspect and familiar to the students. A further condition of instruction was added to these seven, asking about the general feeling of being in the language classroom. This condition of instruction, which does not indicate any specific classroom episode, was intended to represent the student's emotional system's initial condition. The eight episodes are summarized in table 2, and the full conditions of instruction are available in the supplementary material.

Table 2. Classroom episodes.

	Situation	Episode summary
1	General	General feeling in class.
2	Teacher support	Receiving teacher's positive verbal feedback.
3	Investigation	Writing a home assignment on Korean culture in Korean language.
4	Task orientation	Staying focused in order to understand the teacher speaking in Korean.
5	Cooperation	Conducting a roleplay activity with a peer.
6	Organization	Listening to the teacher introducing today's class.
7	Involvement	Being called upon to answer an exercise.

8	Equity	Being given (by the teacher) the same opportunity to practice as the other students.
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All episodes reported in table 2 commonly happen during a class of the Korean language program mentioned above except for episode 3, which relates to a homework assignment. Therefore, the timeframe considered in this study is mainly made up of classroom time.

A pilot study conducted with one learner was used to check whether participants would have too much difficulty sorting the emotions and whether the conditions of instruction were clear. Following the feedback from the pilot study some of the instructions were reworded for clarity, and the Q sample was finalized with the inclusion of 30 emotions (table 3).

Table 3. Emotions included in the present study

1	Joy	16	Disgust
2	Gratitude	17	Embarrassment
3	Serenity	18	Guilt
4	Interest	19	Hate
5	Hope	20	Sadness
6	Pride	21	Feeling scared
7	Amusement	22	Anxiety
8	Inspiration	23	Feeling hopelessness
9	Awe	24	Boredom
10	Love	25	Jealousy
11	Relief	26	Regret
12	Excitement	27	Curiosity
13	Anger	28	Surprise
14	Shame	29	Confusion
15	Contempt	30	Frustration

The grid used in this study was designed with nine columns, with the option to place one card/emotion at two extremes, as in table 4.

Table 4. Sorting grid.

Column value	-4	-3	-2	-1	0	+1	+2	+3	+4
N. of emotions to sort	1	2	4	5	6	5	4	2	1

4.4. Data collection procedure and analysis

Participants conducted their sorting session individually. All sorts were photographed, and all sessions were audio-recorded. All 40 sorts collected (eight sorts for each of the five students) were firstly analyzed together to individuate clusters of situations that trigger similar emotional reactions in different students (inter-individual perspective). Secondly, the eight sorts collected from each participant were analyzed separately to obtain an even more fine-grained understanding of the complexity of the individual learner's emotional system (intra-individual perspective).

The analysis was conducted with KADE v.1.2.1 (Banasick, 2019). All factors were extracted with centroid method and subjected to Varimax rotation. A three-factor solution for the inter-individual analysis was deemed to have the best explanatory power, as the fourth factor was empty. For the intra-individual analysis, a two-factor solution was preferred for each student after consideration of the scree test and the factor eigenvalues. A significant loading of ± 0.48 was firstly calculated for $p < 0.01$. However, the significant loading was increased to minimize the number of confounded sorts (Watts & Stenner, 2012); therefore, a meaningful loading of ± 0.58 and ± 0.64 were used for the inter-individual and the intra-individual analysis, respectively.

After completing each sort, participants were asked to elaborate on the disposition of the emotions placed at the two extremes of the grid and apparently contrasting emotions with a similar rating. The short post-session interviews were conducted to support the interpretation of data and were fully transcribed. Relevant excerpts are used to illustrate the results.

The factor interpretation considers all emotions holistically by comparing their ratings within and across factors; consequently, the two criteria for the inclusion of the emotions in the description of a factor were those of being salient and defining (Baker et al., 2010). For each factor narrative, the rating of emotions on a scale of -4 to +4 is shown in brackets.

5. Results

5.1. Inter-individual analysis

Factor 1

Factor 1 represents 61% of the variance. Nine sorts are associated with this factor. Five represent 'teacher support', three 'equity', and one 'involvement'. Four of the five 'teacher support' sorts are the highest loading on this factor, i.e., the most characterizing.

All situations loading on this factor have in common the interaction between student and teacher. The most dominant emotion in these situations is gratitude (+4), felt when the students receive positive encouragement and when the teacher treats all students without bias. Nevertheless, hope (+2) is also relevant in the same situations. This emotion is felt when the students are about to receive feedback because they do not know whether they are doing the exercise correctly, or before they are called upon to answer, and they hope to do well. Once they know their answer is good, students firstly experience relief (+3), and then serenity (+1), joy (+3), and pride (+2).

Since these situations represent students who are successful in using the language or who are treated with equity, less dominant emotions compared to other situations are confusion (0), frustration (-1), shame (-2), and anger (-3).

Factor 2

Factor 2 represents 11% of the variance. Ten sorts are associated with this factor. Three sorts represent both 'task orientation' and 'involvement', two represent 'investigation', and one represents 'cooperation' and 'equity'.

The situations loading on this factor represent the student losing face in front of their peers, not being able to understand what is going on, or confronting an overwhelming task. In these situations anxiety (+4) and feeling scared (+3) are the most dominant emotions, triggered by the fear of not understanding what the teacher is saying or by the fear of being called upon to answer in front of the class. In the same circumstances embarrassment (+2) may also be triggered, along with confusion (+2) and frustration (+3).

The students also realized that the negative emotions they feel in these situations could be overcome with more study and a better knowledge of the Korean language, which illustrates why the ranking of regret (+1) is higher than in other factors. In these situations, where students mostly experience negative emotions, the high rating of regret should be understood alongside the low rating of contempt (-3), indicating that students blame themselves more than the teacher for these negative experiences.

Importantly, in these situations curiosity (+3) was ranked highly compared to other emotions, and boredom (-2) was ranked low. Students explained that curiosity is triggered by the wish to check whether they are doing well when they are called upon to respond, and by the interest that they have in Korean culture when they prepare an assignment.

Factor 3

Factor 3 represents 4% of the variance. Sixteen sorts are associated with this factor. All students' 'general' situation sorts and four of the 'organization' situation sorts are represented by the structure of this factor. Additionally, three 'investigation' situation sorts, two 'cooperation' sorts, and one each for 'task orientation' and 'involvement' load on this factor.

The dominant emotions in these situations are curiosity (+4), interest, and inspiration (+3). Curiosity and interest are triggered by the expectation to learn new things during or at the beginning of a class, by the teacher's skillful introduction of the daily class topic, or by conducting an assignment on an aspect of Korean culture that attracts attention. Inspiration, on the other hand, is triggered by the teacher's introduction to the class, often done in Korean, which stimulates the students to try to become, one day, as good a speaker as their teacher. Students are amused (+2) by the teacher's introduction to the class, which often involves jokes to attract their attention, and surprise (+2) as the introduction often ends in a twist that leads the students to the main topic of the day.

Considering that all students' general situation sorts are loading on this factor, it is significant to note that embarrassment (-1) resulted a distinguishing low emotion, despite the language classroom, as shown in factor 2, not lacking instances where students could lose face.

5.2. Intra-individual analysis

Hayley

Hayley's classroom emotions are clustered into a first factor represented by the 'general', 'teacher support', 'equity', and 'organization' situations. In these situations Hayley does not actively use the language but receives positive feedback or listens to the teacher, and she feels excitement (+4), gratitude (+3), and serenity (+1). These emotions are also characteristic of her general classroom attitude, as she explained that "It's exciting because I am in the class. I am here to learn Korean, somebody speaks in Korean to me, it's more exciting".

The second factor is characterized by the 'task orientation', 'cooperation', and 'investigation' situations, when she uses the language in productive or receptive activities. In these situations Hayley feels interest (+4) and inspiration (+3), but also frustration (+2) and confusion (+2). In a roleplay situation, she is "interested in experiencing the dialogue, because I don't have any other practice". However, she is also frustrated when she has to produce language because "I don't think I can adequately explain it in Korean".

Curiosity and joy are among the consensus emotions, a term indicating emotions shared by the two factors and relevant for instructed language learning. Hayley explained her curiosity by saying that she usually prepares well before a class, but then, in the actual class, she is curious about how the language is used in practice.

Alice

'Cooperation', 'organization', 'investigation', and 'teacher support' are the situations most affecting Alice's Factor 1. These situations involve using the language in speaking and writing activities with a peer or at home or receiving positive feedback from the teacher. These situations predominantly trigger joy (+4) and excitement (+2). When doing productive activities and pair work, Alice remarked that "I really really like it when we do partner work and just going through the dialogue, because, then you know, it sort of gives you a chance to maybe learn off your partner, even if either yourself or your partner, I mean, do not understand something fully, you can kind of learn off each other, which is really fun".

A second factor clusters together the 'involving', 'equity', and 'class orientation' situations, where Alice speaks Korean in front of the class, or needs to understand what is going on. These situations trigger anxiety (+3), embarrassment (+2), and feeling scared (+2), which reinforce how a language classroom is a place where several events may cause the student to lose face. Alice explained that in this situation, "even if you are confident, like...the answer is like correct, it's still that sort of, I guess, uncertainty and also just talking in front of the class", which indicates that it is the face-threatening situation, more than the nature of the language task, that triggers negative emotions.

What is relevant in Alice's case is that curiosity, interest, and gratitude resulted in consensus emotions, which indicates how these emotions are the most characteristic of her learning experience.

Mira

Mira's five out of eight sorts load on Factor 1, characterized by curiosity (+4) and surprise (+2). These emotions are triggered by situations where she produces language (such as in 'task investigation', 'cooperation', and 'involvement') or listens to the teacher (such as in 'task orientation' or 'organization'). When she listens to the teacher's explanations, she feels curious about learning a language form and is sometimes surprised to learn in which situations it can be used. For Mira, curiosity is also experienced when she is called upon to answer an exercise since "there is a bit of curiosity about where you can improve, whether you got it right".

In contrast, Mira experiences mostly gratitude (+4), excitement (+3), and serenity (+2) in 'teacher support' or 'equity' episodes. When she has the opportunity to use and practice Korean in class, Mira says she feels joy and gratitude because of "the opportunity to practice, and excited, sort of you get the feeling of excitement". For Mira, curiosity and excitement are positively ranked consensus emotions across the two factors, together with interest and inspiration.

Julia

Julia's first factor is characterized by her emotions in situations where she receives feedback, works with other students, or listens to the class introduction. These feelings also characterize her 'general' situation, and are hope (+3), inspiration (+3), joy (+2), pride (+2), and relief (+2). Regarding hope, she explained that "I like learning new languages so I just get very hopeful, just like...but I'm like learning a lot more and really grasping the concept when I am in class", indicating with hope the eagerness to learn new things.

Julia's emotions abruptly shift in situations loading on her second factor, characterized by anxiety (+4), frustration (+3), embarrassment (+2), and feeling scared (+2). These are all situations ('involvement', 'task orientation', 'investigation', 'equity') where she needs to use her language skills actively, often in front of the class. In particular, anxiety and frustration often come from activities involving listening, since she explained that "I would just concentrate more on trying to translate straight away, and I just would, like, miss a word and then I missed the whole next sentence, and then so I do that sometimes in Korean, and then I just get mad at myself for like not paying attention, even though I'm like trying to." Similar to the other students, curiosity emerged as a highly ranked consensus emotion.

Ethan

The four situations characterizing Ethan's Factor 1 require him to actively use his language skills in both productive and receptive tasks or give an answer to an exercise in front of the class ('cooperation', 'investigation', 'involvement', 'task orientation'). These situations trigger anxiety (+3), frustration (+2), confusion (+2) and a feeling of being scared (+2); during a pair group activity, for example, Ethan feels anxiety "maybe because I'm introvert? Yeah, I don't wanna mess up my friend or someone else that I'm not good enough with in Korean". He admits that in these situations "it's a mix of emotions" since he also experiences excitement (+4) and curiosity (+3).

Ethan's second factor is characterized by his general feelings in the classroom and the 'teacher support' situation. Joy (+4), relief (+3), and amusement (+1) are dominant in these cases. Joy comes "when I am learning the language, I feel like I'm accomplishing something. I am very happy. Amusement is, like, when it comes from the teacher making it [the class] interactive".

Like other students, the emotions of interest, excitement, and curiosity resulted in consensus across the two factors.

6. Discussion

The narratives show that learner emotions and context are in a dynamic relation and form a single eco-system (Ushioda, 2015). The analysis demonstrates the complexity of the interconnection between classroom environment and learners' emotions as, depending on the situation, participants showed similar or different emotional reactions, illustrating the continually changing structure of the emotional system.

It is notable that all the sorts conducted under the 'general' condition of instruction cluster in Factor 3, indicating that the default emotional structure is similar for all students participating in this study. Changes to this emotional structure are brought by different perturbations, interacting with the individual learner uniquely and producing emotional reactions that are sometimes similar and sometimes different, as the consideration of learners' reaction to the situations 'teacher support' and 'involvement' exemplifies.

Participants' perceptions of the 'involvement' situation load on all three factors of the inter-individual analysis. This indicates that being called upon to answer an exercise in front of other classmates triggers different emotions depending on the student, leading to the hypothesis that, in this case, there is a very high degree of interconnectedness between the learner's emotional system and other learner variables. In contrast, all sorts related to 'teacher support' cluster on Factor 1 of the inter-individual analysis. Receiving positive feedback triggers similar emotions in different students, consonant with the hypothesis that the learner's emotional system, in this case, is less affected by other variables. The reactions to the situations labelled 'involvement' and 'teacher support' show that the degree of fluctuation may depend on different degrees of interaction between the learner's emotional system and other factors, and that the language classroom is a dynamic space where the teacher, students' emotions, and language tasks are interconnected (Cao, 2011).

Q methodology allows for an even more fine-grained analysis at the level of discrete emotions, showing that, although one emotion can be dominant in certain situations, other

emotions are often triggered together. Gratitude, hope, relief, and joy are among the most representative of the situations clustered in Factor 1, showing that a range of positive emotions is triggered simultaneously. Similarly, in Factor 2, a range of negative emotions such as anxiety, feeling scared, embarrassment, confusion, and frustration, are activated. For Factor 3, defining emotions are curiosity, interest, inspiration, and surprise, confirming the need to understand the role of epistemic emotions better.

Insights on the interconnection of the discrete emotions are provided by emotions without statistically meaningful different ratings across factors, and with similar ratings across factors. This consideration reveals that emotions exist simultaneously but also in contradiction to each other, as argued by Gregersen (2020). Curiosity emerged as an emotion worth more scrutiny since it has been rated positively in all factors resulting from the inter-participant analysis and as a consensus emotion for all factors of the intra-participant analysis. Curiosity may be one of the most relevant emotions in the language classroom, with the power to trigger a "special desire for learning a new language" (Mahmoodzadeh & Khajavy, 2018, p. 334). Anxiety and confusion have not been rated negatively in any factor of the inter-participant analysis, although they resulted in a negative rating in a few factors of the intra-individual analysis. This result shows the overall pervasiveness of a certain degree of anxiety in most episodes. Boredom has not been ranked positively in any factors (both inter- and intra-individual analysis), indicating that it may not play as relevant a role as other emotions. Nevertheless, it is important to note that the students participating in this study reported high interest in the Korean language, which can explain the positive ranking of curiosity and the low level of boredom. The ranking of boredom should be read together with the high level of joy, confirming recent research indicating that increased enjoyment is associated with decreased boredom (Kruk et al., 2022).

Always regarding discrete emotions, hate and disgust deserve a separate mention. These two negative emotions have a similar negative rating in all three factors of the inter-individual analysis. Disgust has a rating of -3 in Factor 1 and 2, and -4 in Factor 3. Similarly, hate has rating of -4 in Factor 1 and 2, and -3 in Factor 3. This result indicates that these two negative emotions are usually not triggered for any student in any of the situations presented and led to the hypothesis that strong negative emotions are probably some of the less activated in a language classroom environment, perhaps only in very peculiar circumstances not considered in this study. This hypothesis is further corroborated by the observation that contempt (-4) does not distinguish between the two factors extracted for Hayley, hate (-4) does not distinguish between the two factors extracted for Alice, and disgust (-4) does not distinguish between the

two factors extracted for Mira. Similarly, the emotions with the lowest rating (-4) in the two factors extracted for Julia are respectively contempt and jealousy, and for Ethan are anger and boredom.

Apparently contrasting emotions coexist at the individual level. For Ethan and Alice, this happens when they use the language in front of classmates or at home while completing an assignment. For example, Ethan's Factor 2 is characterized not only by anxiety and frustration, but also by curiosity and excitement. Anxiety and frustration underscore the difficulty of using the foreign language, while excitement and curiosity indicate the sense of fulfillment in understanding and expressing meaning in Korean. This result confirms that curiosity is triggered by being involved in a comprehension task or a communicative activity (Nakamura et al., 2022). Additionally, curiosity also resulted linked to uncertainty or insecurity, as in Mahmoodzadeh and Khajavy (2018), which explains its coexistence with anxiety. In the same factor, Ethan ranked highly both interest and confusion, confirming that these emotions coexist in a dynamic relation when the learner is academically engaged (Geerling et al., 2020).

The results of this study bear several practical pedagogical implications. Language instructors should note that most of the sorts loading on Factor 1 (inter-participant analysis) are related to the learner/teacher relation, confirming that the individual teaching style directly impacts learner emotions. Consequently, for example, teachers should consider opportunities to provide learners during classroom activities not just with negative feedback, but also with a good amount of positive feedback, because of the power of positive feedback to trigger positive emotions. Furthermore, considering the prominence and role of curiosity and other epistemic emotions and their function in promoting learners' motivation (Muis et al., 2018), language instructors should be planning the first introductory step of their class carefully, since this step supports curiosity and fosters interest. Further class planning should also consider how to sustain curiosity and interest with activities felt relevant by the learner. For example, upon consideration that three learners' 'investigation' sort load on Factor 3 (inter-participant analysis), instructors may want to give students a free topic choice for their home assignments to let them free to explore aspects of the target culture and language that most attract their attention. Factor 2 (inter-participant analysis) foregrounded that calling students upon to answer an exercise may trigger several negative emotions. However, it is notable that also epistemic emotions are relevant to many situations where negative emotions, such as anxiety, are also triggered. In light of this aspect, although it is important to reduce the impact of negative emotions in the language classroom, instructors should remember that even a face-threatening situation such as being called upon to respond does not trigger the same emotions, to the same degree, in all

students, and may trigger anxiety together with curiosity. In this respect, it is the role of the teacher to understand, between deciding whether call students upon to answer or leaving them free to contribute, what strategy works better in their classroom.

7. Conclusion

This research, instead of testing hypotheses, aimed at finding new hypotheses to be tested in future research. Firstly, results confirm that the configuration of classroom emotions is highly dependent on both the individual learner and the classroom environment, with students reacting in similar or different ways to the same classroom episodes, with the ups and downs of the learner's reactions creating ever-shifting structures and continually evolving states of their emotional system. This leads to the hypothesis that different situations trigger interaction across learners' individual systems to a different degree, calling for more research looking at the dynamic interaction of learner emotions with other individual systems. Research has been conducted already at the intersection of emotions and motivation (MacIntyre & Vincze, 2017; Jiang & Papi, 2022), but more is needed to shed light on this aspect by looking at the dynamic interconnection of emotions with, for example, learner mindsets and beliefs, values, intended effort, language learning vision, and perceived learning difficulty. Secondly, both the inter- and intra-individual analysis, necessary to understand emotional interactions and the effects of these interactions within and across systems, have foregrounded the relevance of epistemic emotions for instructed language learning. This result suggests that epistemic emotions, particularly curiosity, may be some of the most prominent emotions affecting the language learner in an instructed classroom setting. Epistemic emotion research in SLA is still in its infancy, and more is needed to understand their effect on the language acquisition process.

Finally, Stephenson mentioned that Q methodology can be applied to "almost anywhere in psychology" (Stephenson, 1953, p. 150) and that the "importance of Q-technique lies more in these psychological applications than in any of the statistical devices it employs or represents" (Stephenson, 1953, p. 29). This paper shows that the Q methodology single-case study can also be applied to SLA and educational research, enabling the researcher to observe at the same time from multiple points of view, and from internal and external perspectives, the multifaceted reality of the variety of dynamic interactions at play within the language classroom environment.

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