



REVIEW

Towards Innovative Research Approaches to Investigating the Role of Emotional Variables in Promoting Language Teachers' and Learners' Mental Health

Ali Derakhshan¹, Yongliang Wang^{2,*}, Yongxiang Wang^{2,*} and José Luis Ortega-Martín³

¹Department of English Language and Literature, Faculty of Humanities and Social Sciences, Golestan University, Gorgan, 15759-49138, Iran

²School of Foreign Languages and Cultures, Nanjing Normal University, Nanjing, 210023, China

³Department of Didactics of Language and Literature, Faculty of Education, University of Granada, Granada, 18071, Spain

*Corresponding Authors: Yongliang Wang. Email: Godfreyeducation@163.com; Yongxiang Wang. Email: nshdyxwang@163.com

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ABSTRACT

The adequacy of language education largely depends on the favorable and unfavorable emotions that teachers and students experience throughout the education process. Simply said, emotional factors play a key role in improving the quality of language teaching and learning. Furthermore, these emotional factors also promote the well-being of language teachers and learners and place them in a suitable mental condition. In view of the favorable impact of emotional factors on the mental health of language teachers and learners, many educational scholars around the world have studied these factors, their background, and their pedagogical consequences. Nonetheless, the majority of previous studies have employed traditional research methods in assessing these variables and their influences on language teachers' and learners' mental health. Because of the complex and dynamic quality of emotional factors, traditional research approaches often fail to evaluate these factors and their dynamic, non-linear connections with teachers' and learners' mental health and well-being. Accordingly, some novel research approaches are required to measure the dynamicity and complexity of emotional factors in language education settings. To address this call, the current state-of-the-art conceptual article seeks to provide new insights for investigating emotional factors and their potential impact on language teachers' and learners' mental states. This study also intends to offer a comprehensive list of emerging methods that take into account the complex and dynamic nature of emotional variables. Finally, the study outlines the potential implications of this review for educational researchers.

KEYWORDS

Complexity; dynamicity; emotional factors; mental health; well-being; innovative research approaches; second and foreign language education

Introduction

Emotional variables, which include positive and negative emotions, are at the core of second and foreign language education [1-4]. It is because the pleasant and unpleasant emotions that language teachers and learners experience

while teaching and learning a new language directly influence their educational behaviors [5-7]. Positive emotions, as put by Dewaele et al. [8], inspire teachers and learners to passionately proceed with the language education process. Negative emotions, on the other hand, typically discourage them from pursuing this laborious process



[9–12]. Moreover, language teachers' and learners' classroom emotions directly influence their mental health [13,14]. While positive emotions promote teachers' and learners' psychological, emotional, and social well-being [13], negative emotions endanger their wellbeing and face them with some mental disorders such as depression, emotional exhaustion, and burnout [14]. Regardless of being positive or negative, academic emotions experienced by teachers and learners throughout the language education process are complex and dynamic in nature [15]. Inspired by "Complex Dynamic Systems Theory (CDST)", MacIntyre et al. [16] articulated that "emotional factors are constantly changing over time and with even small differences in context". According to them, it is not simply language abilities that fluctuate during educational processes, but a variety of emotional elements that are steadily interacting with teacher and learner behavioral patterns. This makes the realm of language education a suitable ground for dynamic and longitudinal research to take root.

The undeniable role of positive and negative emotions in language teachers' and learners' mental condition has made emotional variables an important line of language acquisition research [17,18]. That is, favorable and unfavorable feelings that teachers and learners encounter at various stages of language education have always been central to language studies [19–26]. In the past decade, with the arrival of the positive psychology (PP) movement that mainly focuses on the sources of balances and imbalances in different aspects of human life [27–31], much more attention has been directed towards academic emotions and their potential consequences for teachers' and learners' mental or psychological well-being [32,33]. However, a short glance at the existing literature reveals that the majority of previous investigations employed traditional, linear, and monolithic research approaches to study emotional variables [34]. Given the dynamic, multifaceted, and complex nature of emotional variables [15,16], measuring academic emotions via retrospective, traditional research methods that analyze academic emotions through monolithic and linear lenses seems inappropriate [35,36]. Considering this, the current state-of-the-art paper seeks to offer some innovative avenues for investigating emotional factors and provide a comprehensive list of complexity-informed approaches that enable educational scholars to reliably evaluate teachers' and learners' emotions in language classes.

Literature Review

Complex dynamic systems theory (CDST)

The "Complex Dynamic Systems Theory (CDST)" that is derived from mathematics provides some formulas for examining non-linear, multifaceted elements, behaviors, or phenomena. As a multidimensional framework, CDST has three distinguishing features: stability, variability, and context. As the first outstanding characteristic of CDST, stability means that "dynamic systems are self-organizing and can be settled into preferred states" [37]. The second central feature of this framework is variability, which pertains to the fluctuating state of dynamic systems (i.e., the

phenomenon under investigation) [38]. The last key characteristic of CDST is context, which indicates that the variability or stability of dynamic systems may be vulnerable to situational variables [37]. As put forward by MacIntyre et al. [39], a phenomenon should demonstrate all of the aforementioned features to be examined in light of a CDST perspective. Considering this, emotional factors can be safely examined through a CDST framework in that they are in a state of flux and change with even subtle variations in context [40].

Benefits of Studying Emotional Factors from a CDST Perspective

As a paradigm, CDST appears to offer some innovative and appealing avenues for examining and recognizing the nature of emotional factors in instructional-learning environments [41,42]. Nevertheless, previous scholars have been extremely cautious about using CDST principles in evaluating emotional factors and their influences on teachers' and students' mental health [43]. To dispel their fears, this section intends to describe the benefits of employing complexity-informed approaches in studying emotional variables. The following are some of the most significant advantages of complexity-informed approaches:

- **Timescales:** As put by MacIntyre et al. [16], the most beneficial aspect of a CDST perspective is that it directly addresses time and its influences on the phenomenon under investigation. In fact, complexity-informed approaches help scholars examine how a phenomenon develops over a particular period of time [44]. It is worth mentioning that previous researchers have employed both short and long timescales in their studies, but they have been forced to apply distinct research methods and respond to various research questions. The advantage of complexity-informed approaches is that they explicitly examine multiple, interacting behaviors happening within the chosen timeline.
- **Openness:** Another advantage of CDST approaches is openness, which pertains to the idea that the system is susceptible to sources of effect that were possibly ignored when devising a study design [40]. According to MacIntyre et al. [16], allowing for unpredicted effects on a system "can help bring clarity to the dynamics involved and highlight what is usual and what might be unusual".
- **Variability, Change, and Stability:** The third valuable benefit of CDST or complexity-informed approaches is that they take into account the change and variability of the phenomenon over time [45]. Each condition of the phenomenon under research is considered a modification of the preceding state of the phenomenon [46]. It suggests that a phenomenon's path of change might be extremely sensitive to its initial states. Besides, complexity-informed approaches also enable researchers to assess the dynamic stability of a phenomenon. The term dynamic stability refers to the notion that a phenomenon may remain relatively stable for some period of time [16]. It implies that there can be subtle

variations, fluctuations, and modifications, but the overall condition of the phenomenon stays somewhat static.

With respect to the aforementioned advantages, complexity-informed approaches can be highly beneficial for studying emotional factors in that they enable educational researchers to:

- a) consider how teachers' and learners' emotions change within the selected timescale,
- b) identify what is normal and what is abnormal in teachers' and learners' emotions, and
- c) evaluate the variability and dynamic stability of academic emotions.

CDST Approaches: Beyond Qualitative-Quantitative Division

CDST is an emerging research approach with distinct data gathering and processing procedures [47]. As put by MacIntyre et al. [16], "a gratuitous mention of CDST is not appropriate or even relevant unless a CDST perspective has been applied throughout the design of the study, data collection and analysis process". Thus, researchers and practitioners should avoid dressing a qualitative or quantitative study in CDST clothing since it is a novel and different methodology. The research methodologies below are some of the main instances of CDST approaches.

Process tracing approach (PTA)

Process tracing is a within-case approach (a subset of case-study methodology) for elucidating complicated, causal processes at the micro level of graininess [48]. It is commonly used to offer "evidence-based" historical interpretations and draw conclusions about the causal mechanisms of the case, changing behavior, and arising results [49]. Making such conclusions from earlier incidents and historical information appears to be an instinctive way of understanding their significance. As advocates of the process tracing approach noted, this research method must be systematic, as it is not simply a detective task based on intuitions and feelings from a chronological succession of incidents [50,51].

Retrodictive modeling (RM)

Retrodictive modeling (RM) is a research approach in which complex processes are used as the unit of analysis [52]. This emerging research approach aims to study "how complex, attractor-governed patterns emerge from dynamic, self-organized mechanisms of development" [46]. At its core, retrodiction is a method of studying complicated and nonlinear phenomena that begins with an emerging desired result and proceeds backward, which may appear to be an oxymoron at first, to deduce how that truth happened [53,54]. This research approach is in contrast with "variable-centric" approaches [55], which look forward and strive to experimentally anticipate what will happen.

Concept mapping (CM)

Concept mapping (CM) is a diagrammatic approach, designed by Novak [56], through which researchers can outline

different dimensions of knowledge and illustrate their interconnections by generating concept maps [57]. The primary objective of concept mapping is to provide a comprehensive visual diagram of a "real-world system" and its underlying processes [58]. The diagram is supposed to help researchers in identifying issues of concern in the system's organization or performance [57]. This visual diagram, as Novak et al. [59] mentioned, also enables researchers to tactically intervene in the system with a view to optimizing its functioning.

Agent-based modeling

The term 'agent' in this research approach pertains to creatures, individuals, groups, organizations, and any other thing that employs flexible behavior to fulfill a particular purpose [60]. The notion of 'model' also refers to the "purposeful representations" of actual systems [61]. As a research approach, agent-based modeling creates a straightforward image of a system under study, which is technically called a model [62]. The model can offer a series of rules and demonstrate how the underlying elements of a phenomenon interact [63,64]. As put by Railsback et al. [65], the strength of agent-based modeling is its capacity to portray the interacting constituents of systems and exhibit their emergent features and ongoing reactions while modeling different mechanisms and system consequences.

Social network analysis (SNA)

Social network analysis (SNA) dates back to the work of social anthropologists who constructed "notions of social structure using creative textile metaphors such as fabric, web, intersection, texture, distance, density, and interwoven relations" [66]. As noted by Scott et al. [67], all social network approaches are built on the core notion that the interactions between interrelated systems or elements are of high importance. Accordingly, this research approach demands relational data [68] and presents its frameworks in terms of relational ideas, resources, and procedures [69].

Design-based research methods

Design-based research (DBR) pertains to a set of methodologies used by learning sciences researchers during the last two decades [70]. This interventional methodology was basically designed to bridge the gap between research and practice [71]. The design-based research approach, which is derived from CDST theory, considers education, cognition, and environment as highly related aspects [72]. As put by Fishman et al. [73], scholars commonly employ design-based research methods for examining complicated and emerging phenomena that result from the interplay of many predictable and unpredictable factors.

Nested ecosystem model (Ecological approach)

The nested ecosystem model, proposed by Bronfenbrenner [74], is among the universally accepted frameworks for examining people in ecological settings. Bronfenbrenner [74] characterized the topology of the ecological setting as "a nested arrangement of structures, each contained within the next, which must be examined as an interdependent whole to fully understand the forces surrounding a

developing individual". The nested ecosystem model is comprised of four systems: "microsystem", "mesosystem", "exosystem", and "macrosystem" [75]. The microsystem, as the initial system, pertains to a set of tasks, activities, and mutual relations that a growing individual encounters in a particular face-to-face environment [76]. The second system, mesosystem, represents the interplay of various systems, notably the growing person in the microsystem [77]. The third system, exosystem, encompasses the interrelationship between two or more contexts, one of which does not involve the growing individual but indirectly influences his or her growth in the immediate environment [78]. Finally, the macrosystem involves "the overarching patterns of micro-, meso-, and exosystem characteristics of a given culture, subculture, or other extended social structures" [79].

Ecological momentary assessment (EMA)

Ecological momentary assessment is another novel and emerging research method that comprises repeated evaluation of participants' present activities and experiences in natural contexts [80,81]. The designers of this research methodology asserted that data gathering techniques that collect authentic information from natural environments will dramatically increase the ecological value of mental, physical, social, and emotional phenomena [82]. Ecological momentary assessment seeks to "minimize recall bias, maximize ecological validity, and allow study of microprocesses that influence behavior in real-world contexts" [83]. As pinpointed by Rabasco et al. [84], this innovative approach has three major qualities: (a) evaluations are commonly done immediately; (b) evaluations are made up of several repeated observations; and (c) the needed information is typically evaluated at a certain point in time.

Latent growth curve modeling (LGCM)

Latent growth curve modeling (LGCM) is an extension of the structural equation modeling (SEM) approach, which aims to characterize and evaluate moment-to-moment changes in people's personal traits, attitudes, and educational results [85,86]. This research approach addresses four significant technical issues for evaluating panel data over conventional "regression methods" and "mean comparisons" [87]. First, the dynamic feature of these frameworks considers the repeated measure to be a mechanism that develops across time. Second, the LGCM procedures can effectively display the complexities of non-linear changes. Third, the LGCM procedures provide scholars with a broader collection of research questions. Fourth, the LGCM approach, as opposed to traditional methods, offers a comprehensive comprehension of the dynamic relationship between various "time-dependent" cognitive and non-cognitive elements.

Panel designs

The approach of "panel designs" is one of the longitudinal research methods that allows researchers to assess the same factors on the same person across time [88]. Thus, scholars should track down the same person throughout the data

gathering process to gain a deeper understanding of his or her developmental trend [89]. As Hiver et al. [34] mentioned, this emerging approach has gained more appeal over previous longitudinal approaches as it offers more freedom in assessing change dynamics.

Multilevel modeling

Multilevel modeling is an extended version of the multiple regression method that is used "to examine nested systems and model and partition the variance attributable to higher-level and lower-level units" [47]. In the context of multilevel modeling approach, the notion of nested means clustering [90]. An instructor, for example, may be nested within a classroom within an instructional context within a working environment. Each of these "higher-level units" comprises the "lower-level units" and may have a descending influence on them [91,92]. What distinguishes multilevel modeling from comparable approaches is that it explicitly considers context [93]. Instead of viewing all subjects identically, the multilevel modeling takes into account the particular environment from which each participant originates.

Time series analysis (TSA)

Time series analysis (TSA) is a systematic research approach through which "one goes about answering the mathematical and statistical questions posed by time correlations" [94]. Time series analysis often comprises numerous time-ordered observations, which enables scholars to work with dozens of data points gathered over time [95]. This research approach is of two types, namely the "time domain approach" and the "frequency domain approach" [96,97]. While the time domain approach primarily focuses on the examination of lagged connections, the frequency domain approach typically concentrates on the evaluation of cycles [98].

Idiodynamic approach

The idiodynamic approach, which has its roots in complex dynamic system theory (CDST), seeks to uncover time-dependent changes and their underlying reasons [39]. According to MacIntyre [38], this approach takes "an individual acting during an event as the basis for analysis, as opposed to an approach based on identifying group-level traits or individual-level traits". In contrast to many research methodologies that delve into the overall outcomes of a process [99], the idiodynamic approach mainly focuses on the developmental pattern of a process [100].

Factor of curves model (FCM)

Factor of curves model is among the higher-order modeling approaches that allows for "the examination of both trajectories of specific subdomains and trajectories of the global, second-order domains" [101]. Unlike "growth curve models" that employ composite metrics and compute few parameters [102], the factor of curves model considers the unequal contribution of the "primary growth factors" to the "second-order factors" of the model [103]. By developing primary growth elements that are unique to the flexibility of subdomains [104], the factor of curves model enables each subdomain to constantly change across time.

Experience sampling method

The experience sampling method is basically designed to investigate “flow experiences” that occur in our daily life [105]. In fact, like other complexity-informed approaches, experience sampling also enables scholars to gather the needed information in real time [106]. The most outstanding quality of this research method is that “it prompts individuals to respond to data elicitation stimuli at regular intervals” [47]. For instance, participants are given a device, such as a smartphone or a pager, which sounds at different moments throughout the day. After hearing the sound, participants need to respond to several questions regarding the activity they were doing at the time [107].

Q methodology

The Q methodology is another innovative research approach through which subjective matters, including beliefs, ideas, thoughts, and attitudes, can be systematically examined [108,109]. As Newman et al. [110] mentioned, this approach enables scholars to recognize multiple viewpoints within a group. It thus allows researchers to compare different individuals’ viewpoints and diagnose their potential commonalities and variations [111]. In Q methodological research, respondents are typically presented with a set of statements about a certain issue and invited to organize these statements based on their personal perspective [112,113]. As put by Ramlo et al. [114], Q samples can be developed through various sources: “naturalistic”, “ready-made”, and “hybrid”. Naturalistic statements are typically generated by direct interactions with respondents, such as focus groups, interviews, diary writings, and blogs [115]. Ready-made statements, on the other hand, are derived from sources other than respondents’ direct interaction (e.g., questionnaires, magazines, media reports, etc.) [116]. Finally, as Ramlo [117] noted, hybrid samples merge ready-made statements with naturalistic ones.

Research Instances of CDST Approaches in Language Studies

As previously mentioned in this study, CDST approaches empower researchers to evaluate the complicated nature of phenomena under investigation and trace their potential fluctuations over time [47,15]. With the advantages of CDST approaches in mind, several educational researchers worldwide have employed these emerging approaches in language studies [36,118–132]. Gregersen et al. [123], for instance, measured the moment-by-moment fluctuations in language learners’ anxiety using the idiodynamic method. For this purpose, participants were asked to self-rate their anxiety levels over time. The findings uncovered the rapidly changing nature of learner anxiety throughout the language learning process. In another study, Hiver [124], for instance, examined the dynamicity of L2 instructors’ immunity through retrodictive qualitative modeling. To do so, a large sample of L2 instructors, practitioners, and teacher trainers was selected from a public educational institution in South

Korea. The needed information was then collected through closed-ended questionnaires and in-depth interviews. Data analysis revealed that practitioners’ emotional, mental, and intellectual performance in L2 education contexts is closely tied to instructors’ immunity. Further, using latent growth curve modeling, Elahi Shirvan et al. [121] explored the developmental and changing patterns of college students’ enjoyment and anxiety in general English courses. The information collected from 367 college students demonstrated that participants’ anxiety level remarkably decreased during the course. The gathered data also revealed a significant increase in participants’ classroom enjoyment. In a similar vein, Boudreau et al. [119] employed an idiodynamic approach to assess learners’ anxiety and enjoyment throughout a language course. They also attempted to evaluate the association between these two emotional factors. The researchers used some oral tasks and semi-structured interviews to collect the required data. Analyzing respondents’ answers, they discovered that there is a highly dynamic association between language learners’ anxiety and enjoyment. Likewise, Khajavy et al. [125] examined the potential relationships between language learners’ anxiety, enjoyment, and willingness to communicate through an experience sampling method. To accomplish this, 38 Iranian English learners were invited to engage in this research. The analysis outcomes indicated that there is a constant, significant, and favorable association between learners’ anxiety and their willingness to communicate. Data analysis also revealed that there is an unfavorable and inconsistent relationship between learners’ enjoyment and their desire to talk. Moreover, in a longitudinal investigation, Kruk et al. [126] used latent growth curve modeling to study the subdomains of boredom and their co-development in online English courses. In doing this, a researcher-developed questionnaire was shared among 412 English learners. The study outcomes demonstrated that there is a substantial decrease in the subdomains of boredom across time. Furthermore, Kruk et al. [36] took an ecological perspective to look into the emergence of boredom in online English classes. To this aim, four intermediate English learners were asked to take part in this study. To collect the required data, two interview sessions were held at two different times. The analysis of interview transcripts showed that participants perceived teaching style, class assignments, and technological issues as the main causes of boredom in online English courses. Additionally, using an idiodynamic approach, Lee et al. [127] inspected the dynamicity of students’ willingness to communicate in online English courses. To do so, seven English learners were requested to score their desire to communicate in online classes. Semi-structured interviews and stimulated recalls were then employed to uncover variables leading to dynamic changes in participants’ desire to talk. The outcomes revealed that English learners’ willingness to communicate in online classes constantly changes as a result of both trait-like and state-like variables. In a more recent inquiry, Dewaele [120] studied the dynamic connections between English learners’

internal factors, anxiety, and enjoyment via an idiodynamic method. The study findings indicated that some internal factors, including age and multilingualism, are not related to learners' anxiety and enjoyment levels. Other internal factors, like the learners' attitudes toward English, were found to be closely linked to their anxiety and enjoyment.

Conclusion and Implications

The present article can provide new insights for studying emotional factors in language education contexts. To this end, we discussed how "complexity perspectives" may lead to new ways of analyzing and interpreting the nature of academic emotions in language courses. Then, we highlighted the most valuable benefits of studying emotional factors from a complexity perspective. We finally offered several complexity-informed approaches, including the process tracing approach, agent-based modeling, nested ecosystem model, ecological momentary assessment, and latent growth curve modeling, which enable educational researchers to measure classroom emotions and their rapidly changing effects on language teachers' and learners' mental health. Educational researchers may find this review study highly useful and informative by understanding the benefits of CDST approaches in examining emotional factors. In fact, this study may dispel their fear of employing a complexity perspective in language studies and prompt them to use CDST approaches for evaluating positive (e.g., enjoyment, happiness, hope, pride, interest, and compassion) and negative emotions (e.g., anger, anxiety, frustration, stress, disappointment, and hopelessness) in second or foreign language classes. Researchers can employ CDST approaches, notably those covered in the current research, to trace the moment-to-moment changes in language teachers' and learners' emotions. Using CDST approaches, researchers can look into the potential influences of emotional variables on language teachers' and learners' mental health. In fact, CDST approaches empower language researchers to reliably evaluate the role of emotional factors in promoting language teachers' and learners' well-being. Through these approaches, scholars can also assess the dynamic stability of emotions under investigation. Unlike conventional, retrospective approaches that merely measure the constant and linear relations between emotional factors, CDST approaches help researchers evaluate the dynamic and non-linear associations as well. With these valuable benefits in mind, we strongly encourage all educational researchers around the world to investigate emotional factors from a complexity perspective in order to come up with more accurate and trustworthy results.

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