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The Interplay among EFL Students' Epistemic Beliefs, Language Learning Strategies, and L2 Motivational Self System: A Structural Equation Modeling Approach

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Abstract

Examining learners' beliefs about the essence of knowledge, how they are conceptualized, and the ways they influence the learning process have gained attention in the second language (L2) learning. This study employed a multivariate statistical framework to model complex relationships among three constructs, i.e., epistemic beliefs (EB), language learning strategies (LLSs), L2 motivational self-system (L2MSS), and their sub-factors (N = 12). The data were collected in *two phases.* At the preliminary stage, the structural equation modeling (SEM) was conducted to visualize a hypothesized model and to map the conceptual framework of the study. At the secondary step, three questionnaires, EB, LLSs, and L2MSS, were distributed among junior high school students (N = 300). The questionnaires were collected over four months. The collected data were screened for incomplete responses and sample attrition. Notably, 774 questionnaires met a valid response rate of 95 percent. Correlational and SEM analyses were utilized to probe the causal relationships among the constructs. The findings revealed that there was a significant positive relationship between the subscales of L2MSS and LLSs. However, there was a significant negative relationship between EB and LLSs. Besides, confirmatory factor analysis underpinned the fitness of the hypothesized model after two stepwise corrections. The findings revealed that the path coefficient for EB had a significant impact on the LLSs with the mediating role of L2MSS. In particular, the path analysis revealed that 48% of LLSs might be explained through EB and L2MSS. This paper suggests that the more EB students experience, the less likely they adopt learning strategies, and the more L2MSS they hold, the more LLS students employ.

Keywords: Epistemic Beliefs, Language Learning Strategies, Motivational Self-System, Second Language Learning, Structural Modeling Approach

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1. Introduction

For the last decade, a growing body of studies (e.g., Hofer, 2016; Hofer & Pintrich, 1997; King & Kitchener, 1994) focused on learners' beliefs, the effectiveness of LLSs, how they come to know, and how the beliefs held by learners can promote their thinking and reasoning process. L2 practitioners and researchers unanimously conceptualized the concept of learning (COL) as a cornerstone for each system of education. Chan and Elliott (2004) conceived COL as teachers' and students' preferred learning style, experience, and beliefs. Numerous phenomenological studies (Hammer & Elby, 2002; Hofer, 2016; King & Kitchener, 1994; Osiochru, 2018), which identified factors affecting students' learning, have distinguished two levels for the COL: a higher and a lower level. The former comprised *memorizing, rehearsing, and preparing for exams,* but the latter encompassed promoting one's *knowledge, applying, finding out, and exploring a new method*. Researchers in the field of L2 teaching acknowledged that students' COL (Chan & Elliott, 2004), EB (Ekinci, 2017; Hofer, 2016; Schommer, 1990), LLSs (Chamot, 2019; Cohen, 2018; Oxford, 1990), and motivation (Busari, 2018; Dörnyei, 2020; Dörnyei & Ryan, 2015) could account for the rate and route of the learning process. In particular, in the last 25 years, L2 professional literature has witnessed considerable studies in the areas of L2 *motivation, LLSs*, and learners' *EB* (Al-Hoorie, 2018; Busari, 2018; Dörnyei, 2009; Ellis, 1994; Mercer & Dörnyei, 2020; Oxford, 1990; Papi, Bondarenko, Mansouri, Feng, & Jiang 2019; Winberg, Hofverberg & Lindfors, 2019). Researchers (Busari, 2018; Dörnyei & Chan, 2003; Dörnyei & Ushioda, 2011; Lila, 2016) considered motivation as a multi-faceted construct that influences different dimensions of L2 learning. These studies have resulted in the conclusion that high motivation in learning helps learners involve and persist longer, gain knowledge in a more coherent form, apply their knowledge in a real-world situation, and get higher academic achievement in the long run. In the same vein, studies (e.g., Chamot, 2019; Cohen, 2018; Ellis, 1994; Griffiths, 2018; Habók & Magyar, 2018; Hajar, 2019; O'Malley & Chamot, 1990; Oxford, 2017; Oxford & Nyikos, 1989) in LLSs focused on the types of mental and behavioral activities which EFL learners involved in the process of learning. Salient taxonomies of LLSs include, but are not limited to, cognitive, affective, or socio-affective strategies (O'Malley & Chamot, 1990), L2 learning and use Strategies (Cohen, 1998), direct and indirect strategies (Oxford, 1990). Cohen (1998) believes that studies in LLSs have underscored on the identification, representation, and classification of the powerful strategies.

Increased research interest in student-centered learning approaches amidst L2 practitioners has turned the construct of EB as a target of interest in education. EB is frequently cited as learners' beliefs about the essence of knowledge, the criteria for the learning process, and how knowledge is conceived (Aditomo, 2018; Bendixen & Feucht, 2010; Perry, 1970). The EB, as conceptualized by Ekinci (2017), is a philosophical aspect supporting source, accuracy, acquisition, and transformation of knowledge. Many researchers have established the connection between students' EB and the learning process. More precisely, numerous studies (e.g., Bråten & Olaussen, 2005; Ekinci, 2017; Hofer & Pintrich, 1997; Liao & Wang, 2018; Winberg, et al., 2019; Yang, Baghat & Cheng, 2019) have advocated that EB have direct and indirect effects on learners' academic performance. They investigated EB with diverse mediating roles (e.g., *motivation, language anxiety, LLS, Self-efficacy, self-regulated learning strategies and task performance*). These studies ended with the conclusion that EB can promote students' conceptualization of knowledge, and learners' motivational beliefs. Schommer (1990) posited that learners' EB is a predictor of motivation, self-efficacy, and academic success in a positive direction. Currently, EB turned out to be a target of increased research interest in L2 due to the interacting nature of this construct with cognitive and metacognitive strategies, self-efficacy, anxiety, and motivation (Bellad, Gu, Kim, & Turner, 2019; Bråten & Olaussen, 2005; Busari, 2018; Hammer & Elby, 2002; Lin, Deng, Chai, & Tasi, 2012; Osiochru, 2018). Many works conducted in this field have been originated in Perry's (1970) epistemological model. Perry conceptualized personal epistemologies as *positions of intellectual development*. Perry's model served for understanding knowledge (i.e., how students construct their educational experiences). However, Perry's perspective on knowledge construction has witnessed a paradigm shift from a cognitive and process-oriented approach toward a motivational aspect.

Following the theoretical underpinnings of EB and the pivotal role of learners' strategies in learning, this study strives to fill the gap by modeling the structural relationships between EB and LLSs with the mediating role of Dörnyei's (2005) L2MSS. Dörnyei (2007) postulates that "the cognitive-situated period of [second language] motivation research shifted the attention to classroom-specific aspects of motivation and created a fertile ground for educational implications directly relevant to classroom practice" (p. 111). Despite the importance of EB in language learning, to date no research has been conducted to model the structural relationship among EB, LLSs, and L2MSS at the high-school level. Accordingly, this paper intends to explore if EB positively predicts L2 LLSs. It has been hypothesized that EB contributes to an increase in LLSs, which in turn fosters students' academic achievement. Besides, students' EB with the mediating role of L2MSS may have a

significant effect on students' LLSs. Despite sufficient evidence to advocate the positive impact of EB in academic achievement, this study argues that constructs such as LLSs, L2MSS have a complex and unpredictable relationship. Furthermore, they have been a topic of much interest and research in recent years (Chamot, 2019; Dörnyei, 2020; Griffiths, 2018; Takeuchi, 2019), and they have witnessed the breakthrough in the studies in L2 learning (Yang, et al., 2019). Thus, the findings may be noteworthiness because the direct/indirect interconnection among EB, L2MSS, and LLSs can yield exciting results. To undertake the study, the following research questions were addressed:

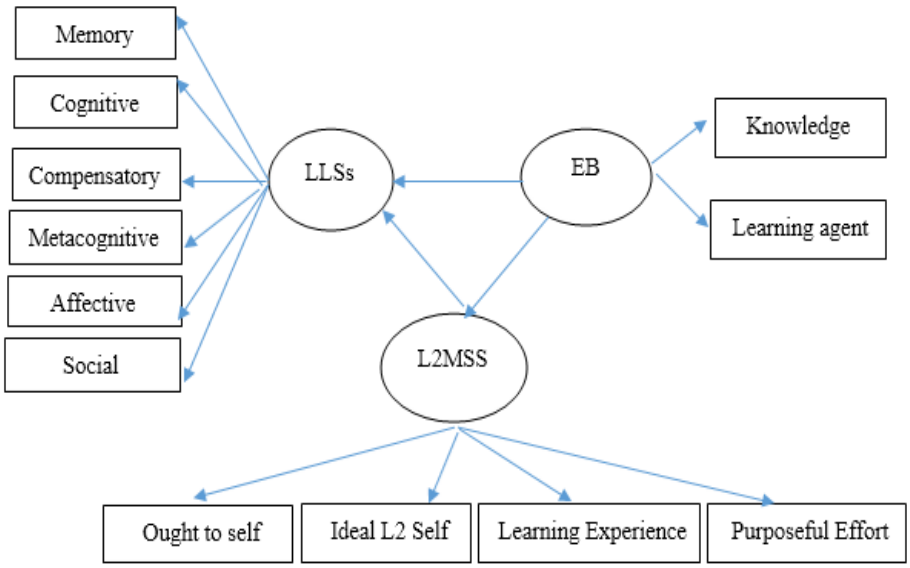
1. Is there any significant relationship among high school students' epistemic beliefs, language learning strategies, and their L2 motivational self-system?
2. Do epistemic beliefs have a significant direct effect on students' language learning strategies?
3. Do epistemic beliefs with the mediating role of L2 motivational self-system have a significant indirect effect on students' language learning strategies?

1.1. Conceptual Framework of the Study

The current study was grounded on Schommer's (1990) conceptualization of EB (i.e., *the theory of the system of independent* belief), and Dörnyei's (2005) theory of motivation (*i.e., L2MSS*). Both arguments are discussed independently, followed by a description of the importance of integrating each. To accomplish the objectives, the SEM approach was adopted. Accordingly, a path diagram was created based on prior knowledge, theories, and L2 professional literature to visualize a hypothetical model. It is a process that occupies a vital place in the theoretical and applied phases (Gladun, 1997). Drawing on the theoretical backgrounds, some constructs (N = 3) and components (N = 12) have been proposed to map the conceptual framework and to predict the applied activities. Notably, the conceptual model predicts a causal path and the relationship between EB and LLSs through the mediating role of L2MSS. Song, Morris, and Stein (2016) proposed guidelines for generating a path diagram. They suggested that rectangles indicate observed variables, circles/ovals illustrate unobserved constructs, and unidirectional arrows represent causal paths (i.e., one variable affects another variable directly). Fig. 1 depicts a hypothetical structural model and the directional paths among the constructs and the sub-factors.

Figure 1

Hypothetical Model of Interrelationships among EB, LLSs, and L2MSS



2. Literature Review

2.1. Epistemic Beliefs: Theoretical Framework, Development, and Dimension

Epistemology is a philosophical construct, which deals with the rationality of beliefs, the nature, source, and transferring of knowledge (Hofer & Pintrich, 1997). Different notions (e.g., *'epistemological beliefs'*, *'epistemic cognition'*, *'epistemic cognition'*, *'epistemological resources'*, *'epistemological reflection'*, *'personal epistemologies, 'reflective judgment'*) have been acknowledged in the literature to refer to EB. However, all subsumed under the term EB due to its readability (Bellad et al., 2019; Osiochru, 2018). Originally, Piaget (1950) coined the label *genetic epistemology* to clarify the *intellectual developmental theory*. Along parallel lines, Perry (1970) was pioneered in the field who classified students in four terms of *dualism, multiplism, relativism, and commitment*. Perry suggested that learners go through a predictable stage of epistemic growth ranging from dualist to relativist epistemologies. Later, Hofer and Pintrich (1997) classified epistemic studies into six categories: (a) Perry's theory of epistemological development, (b) measurement tools, (c) gender-related

studies, (d) epistemic awareness, (e) dimensions of EB, and (f) examining how EBs affects the learning process.

Initially, researchers (Hofer, 2016; King & Kitchener 1994; Schommer, 1990) theorized that EB is a unidimensional facet. They underscored that EB develops longitudinally from simple to complex thinking processes. However, there is little congruence among the researchers on the actual categories of EB. They unanimously posited that EB is a complex system comprising various independent facets. Schommer (1990) introduced three separate repertoires about the *structure and source of knowledge*. Schommer asserts that knowledge is (a) *simple*, (b) *certain*, and (c) transferred by the *authority*. Later, Schommer (1990) proposed five dimensions for EB. She studies the following aspects: *the source of learning and innate ability, the simplicity and the certainty of knowledge structures, and the rate of acquisition.* Schommer conceptualized that the EB is a personal and implicit belief attribution. It deals with students' assumptions about learning and the essence of knowledge. Similarly, Hofer and Pintrich (1997) identified four discrete constructs: *simplicity, certainty, the source of knowledge, and the rationale for knowing.* They conceived EB is the beliefs held about knowledge and understanding. Differently, Hammer and Elby (2002) suggested the importance of *domain specificity* of EB. They attested that an individual might have numerous epistemic resources that might be activated in a specific situation. They identified two discrete resources of knowledge (i.e., transmitted and fabricated stuff). Many practitioners (Aditomo, 2018; Bellad et al., 2019; Osiochru, 2018; Schommer, 1990; Hofer & Pintrich, 1997) concurred that beliefs held by learners have unique impacts on the strategies they employ. Researchers acknowledged that EB comprised different autonomous dimensions, each of which can promote the learning process.

2.2. L2 Motivation Self-system: Conceptual Underpinnings

Motivation can commonly be identified as a set of orientations, motives, driving forces, or objectives that specify one's behavior (Dörnyei, 2005; Dörnyei & Ushioda, 2011). Dörnyei (2009) conceptualized motivation as the tendency to reduce the difference between a learners' current self and conceived self-guides. Notwithstanding that the concept has been frequently used in educational studies, there is little consensus about the meaning of motivation (Dörnyei, 2005). The focus of motivational studies changed into different aspects. Within the *behavioral framework*, it was perceived as instinct and reinforcement, driven by previous experiences of reward for behavior (Weiner, 1990). By evolving the *cognitive revolution,* motivation was recognized as "striving towards more complex and differentiated

development of the individual's mental structures" (Oxford & Shearin, 1994, p. 23). With the advent of the *constructivist* approach, motivation foregrounded social context and personal choices (Dörnyei & Ryan, 2015). Historically, L2 motivational researches date back to the late 1950s and early 1960s. During this period, numerous approaches, models, and theories have been generated. The first famous theory initiated with the work of Gardner's socio-educational model (1985). This model argues that learning an L2 is not similar to other school subjects because it demands alertness to the target group and the tendency to take attributes from it (Al-Hoorie 2018). The model is bifurcated into *instrumental and integrative* motivation. The former referred to functional reasons for learning the language, and the latter alluded to learners' motive to interact or join with the members of the target community. However, the model suffered some limitations in the EFL contexts due to the boundaries in communicating with the target language community (Khajavy & Ghonsooly, 2017). From the 1990s, the *cognitive-situated* period has emerged. Various theories (e.g., *attribution theory, Possible-selves theory, determination theory, and goal theory*) have emerged from the cognitive revolution. The prominent theory in this period was Noel's (2003) *self-determination theory (SDT)* concentrating on *intrinsic and extrinsic motivation* (Taguchi, Magid & Papi, 2009). The former pursued an action for its sake (e.g., enjoyment, pleasure, and happiness), and the latter tracked something as a means to an end (e.g., receive a good grade or avoid punishment). In the next phase, studies have been changed to *a process-oriented* approach. Dörnyei and Otto (1998) conceived motivation in terms of a process-*oriented* perspective comprising *pre-actional, actional, and post-actional phase*. In the first phase, learners' goals, objectives, and intentions were formulated. The next stage was concerned with the actualization of learners' plan. The last stage dealt with the appraisal of the outcome of the achieved task, and the reflection of inferences to be extracted for further performance. This approach adopts a *dynamic orientation* toward motivational research, which integrated numerous dimensions concerned to the learner, learning environment, learning task into a more multiplex system (Dörnyei & Ushioda, 2011).

The current focus on motivation lies in Dörnyei's (2005) L2MSS. This theory was affected by different influential theories (e.g., *the socio-educational theory*, Gardner, 1985; *possible-selves theory*, Markus & Nurius, 1986; *self-discrepancy theory*, Higgins, 1987). Markus and Nurius (1986) defined possible-selves as the manifestations of an individual's self in future states comprising thoughts, visions, and emotions, and the representations of learners' objectives and expectations. Dörnyei and Ryan (2015) posited that the L2MSS generated "an exceptional wave of interest with literally hundreds of studies appearing worldwide" (p. 91). They distinguished L2MSS as a

socio-dynamic perspective due to the powerful feature of motivation and its temporal variability. Based on this theory, Dörnyei criticized the role of the integrativeness concerning students' motivation (MacIntyre, MacKinnon, & Clement, 2009). Notably, they postulated that students do not interact with the target language community in an EFL context. Thus, learners' the integrative motive would diminish in such a context. Dörnyei conceptualized motivation as the way a student recognizes the interaction between his or her ongoing and upcoming notion of self. Dörnyei proposed tripartite dimensions of L2MSS: *(a) the ideal L2 self, (b) the ought-to L2 self, and (c) the L2 learning experience.* The *ideal-L2 self* refers to the situation one would ideally like to reach. It deals with the ultimate perception a learner opted for. The *ought-to-L2 self*, on the other hand, refers to the "the attributes that one believes one ought to possess" (p. 105). This component is the outward aspect of L2 self, which draws on various underlying constructs such as Higgins' (1987) ought-to self, Noels' (2003) and Ushioda's (2001) taxonomies. It represents the attributes like expectations and avoidance duties projected by peers. On a different dimension, *the L2 learning experience* concerns the "situation-specific motives related to the immediate learning environment and experience" (Dörnyei, 2005, p. 7). This phase attributes to the *process-oriented model and intrinsic classifications*, which dealt with learners' experience in different aspects such as teachers, syllabus, lesson plan, classmates, and curriculum.

2.3. On the Connections among EBs, LLSs, and L2MSS

Motivation is closely linked to learners' beliefs (Khajavy & Ghonsooly, 2017; Papi, et al., 2019). Dörnyei (2020) posits that learners' image of themselves in the future (i.e., the ideal L2 self and the ought-to L2 self) are the keystone in L2MSS. Additionally, the L2MSS encompasses the L2 learning experience, "which concerns situated, 'executive' motives related to the immediate learning environment and experience" (Dörnyei, 2009, p. 29). Al-Hoorie (2018) concludes that learners' vision plays a leading role in fostering beneficial language learning behaviors. Takeuchi (2019) also proposes the probability of replacing the notion of LLSs with that of self-directed learning (i.e., self-regulation). Learners' beliefs and their COL seem to influence their behaviors in the classrooms, the type of strategies they use, and their motivation to learn a language. Accordingly, L2MSS and EB assumed to be a key aspect of language learning behaviors. Numerous L2 professional practitioners (e.g., Busari, 2018; Chamot, 2019; Cohen, 2018; Ellis, 1994; Griffiths, 2018; MacIntyre, et al., 2009; Oxford, 1990; Schmidt & Watanabe, 2001) have underscored the role of LLSs in the learning process. Despite the researchers' agreement for the pivotal role of the learning

strategies, there is disagreement in defining LLSs and the way they influence the learning process. Tarone (1983) described LLSs as learners' efforts to integrate linguistic and sociolinguistic competence into their interlanguage competence. O'Malley and Chamot (1990) conceptualized LLSs as the particular actions learners take to understand, learn, or retrieve new information. Another definition proposed by Ellis (1994) as "an attempt to develop linguistic and sociolinguistic competence in the target language" (p.530). Quite a few studies sought the interplay between LLSs in the light of different variables such as personality type (Ehrman & Oxford, 1990), motivation (Schmidt & Watanabe, 2001), attribution and students' self-efficacy (Graham, 2004), and learners' beliefs, to name but a few. Recently, a growing body of researchers (e.g., Al-Hoorie, 2018; Chamot, 2019; Dörnyei, 2020; Griffiths, 2018; Winberg, et al., 2019) have gained attention on the interplay among learners' beliefs, learning strategies and their internal deriving force to learn. These studies have expanded the attitudes regarding the process of thinking about knowledge, motivational beliefs, and learning strategies. In particular, uncovering the interplay between learners' EB and their tendency for thinking process can generate pedagogical implications. To put it simply, applying EB, L2MSS, and LLSs in L2 classrooms can assume that those who imagine a high L2MSS and EB can employ different LLSs. This feeling can affect the learning process.

3. Method

3.1. Participants

To fulfill the purpose of the study, 300 participants (150 males and 150 females) were randomly selected from a population (N = 500) of different high-school students in two cities. They were recruited using a cluster random sampling method. The sampling multistage comprised of cities, districts, high-school, gende0r, and age. To minimize the bias effect, the cluster was randomly selected from various single-gender schools at three districts in two cities. The participants were selected from state schools where boys and girls attended 24 separate classes in 14 different schools. All participants were in their second year having already experienced in learning English. They ranged in age from 15 to 18 (M =16, SD = 1.60). They all had learned English for four years, with little focus on speaking skill. They were native speakers of Persian sharing a common social and cultural background who were selected from a cluster of the entire populations of Amol and Babol, two adjacent cities in the north of Iran.

3.1.1. Sample Size Requirements for Structural Equation Modeling

There is a consensus among the researchers that the number of observed variables could be regarded as a criterion for the proper sample size

by using SEM. Bentler and Cho (1987) proposed a ration as low as 5 or 10 observations per estimated parameter when latent variables have various sub-scales. A general rule for sample size in the SEM model is a minimum factor of 15 for the observed variables (Marsha & Hau, 1999; Tabachnick & Fiddle, 2011). This study sought to uncover the interplay among EB (N = 2), L2MSS (N = 4), and *LLSs* with (N = 6) different components. To determine a sufficient sample size regarding the sub-factors (N = 12) and to apply the coefficient of 15 per variable, a total number of 144 high school students were considered as a sufficient sample size. Therefore, a total of 300 participants were selected for the data collection. The number seems to be appropriate, as some students may be reluctant to provide a valid response. Accordingly, they would be excluded from the sample size, and only the valid questionnaires are analyzed.

3.2. Materials and Instruments

3.2.1. Schommer's (1990): Epistemological Beliefs Questionnaire (EBQ)

This study used a revised version of EBQ, which was originally developed by Schommer (1990). The EBQ comprised 16 items in either the negative or positive extreme on two constructs: *Knowledge and learning agent*. The former sought information on learners' simple/definitive knowledge (9 items), and the latter measured students' fast/fixed learning agent (6 items). Students rated the statements on a seven-point Likert scale from 1 (strongly disagree) anchoring the right end to 5 (strongly agree) anchoring the left end with certain views on knowledge and knowing. The score in a complete EBQ ranged from 16 (minimum) to 112 (maximum). EBQ was translated to Persian, and then all items were back-translated and compared with the original draft. Moreover, it was normed for the Iranian context by Rezaei, Aghazadeh, and Mohammadzadeh (2010). To test the construct validity, exploratory and CFA were run. The total variance explained by the dimensions was calculated to be .63%. Additionally, Rezaei et al. (2010) reported that Cronbach Alpha coefficient of the factors enjoyed a value of (Cronbach alpha = .74) for simple/definitive knowledge, (Cronbach alpha = .67) for fast/fixed learning agent, and (Cronbach alpha = .83) for all subsets. For the current study, the revised version was piloted among 100 junior-high-school students in Amol and Babol, Iran. Some of them also joined the follow-up interviews to ensure the comprehension of all items. The reliability value for each factor was as follows: simple/definitive Knowledge (Cronbach alpha = .78) and fast/fixed learning agent (Cronbach alpha = .76). The total reliability coefficient was (Cronbach alpha = .77).

3.2.2. Taguchi et al. (2009) L2MSSQ

To document students' motivational behaviors, the L2MSSQ was used. It was developed by Taguchi et al. (2009) based on established frameworks: Gardner's (1985) theory of motivation, Dörnyei's (2005) framework of motivational strategies, and Guilloteaux and Dörnyei (2008) classroom observation instrument. The first version comprised 48 items in 10 factors. For data collection of the present study, the Persian-translated version of L2MSSQ was employed. It was already translated into Persian by Taguchi et al. (2009). They reported the reliability of .83. The adapted version was normed and modified for the Iranian context by Papi and Abdollahzadeh (2012). It was piloted among high-school students. After editing and piloting the translated version, the final draft encompassed 24 items in two main parts. One section was to document the participants' perceptions and motivation toward learning English. It was arranged in statement-type items. The items were measured by six-point Likert scales varying from 1 (strongly disagree) to 6 (strongly agree). This section contained four subscales, including *ideal-L2 self, Ought-to-L2 self, attitudes to learning English, and the intended effort*. Each comprised of 6 items. More specifically, ideal-L2 self-measured particular facet of students' ideal self. Ought-to L2 self gauged the traits that a learner thinks to possess (i.e., responsibilities, duties, or commitments). The intended effort quantified students' intended endeavor toward learning English. Finally, the last subscale determined specific motives concerned with a direct learning experience. The other section was devoted to learners' demographic information. It included questions about learners' background information (i.e., age, gender, self-reported proficiency level, duration of learning English). Papi and Abdollahzadeh (2012) undertook the reliability and validity of the new version among different students in Iran. The collected data were subjected to CFA to check the construct validity. Furthermore, to determine the reliability of the adapted version, Cronbach alpha coefficients were run for different scales. The Cronbach alpha coefficient of each scale has been provided as what follows: Ideal-L2 self (Cronbach alpha = .77), ought-to self (Cronbach alpha = .70), L2 learning experience (Cronbach alpha = .84), and attitudes to learning English (Cronbach alpha = .80). Likewise, Azarnoosh and Birjandi (2012) piloted the Persian version of the questionnaire among 104 junior-high-school students. The coefficient for each scale was computed separately. The Cronbach alpha coefficients of the total scale enjoyed a high reliability index of .92. Cronbach value indicates how different scales examine the same underlying factor. Pallant (2007) proposed a reliability coefficient above .70 as acceptable. Since all items and the corresponding scales exceeded .70, the reliability could be assumed in the context of Iran. The L2MSSQ has been repeatedly piloted in various contexts, indicating a satisfactory level of

reliability (Khajavy & Ghonsooly, 2017). Taguchi et al. (2009) have also examined the reliability in different contexts such as Japanese, Chinese, and Iranian, yielding an acceptable level of reliability of (.78, .81, and .83, respectively). Knowing the fact that reliability is sample dependent, the L2MSS was examined among 43 high-school students at state-run schools in Amol and Babol, Iran. Cronbach alpha reliability was found to be .86. Thus, the questionnaire deems to be an appropriate instrument for high-school students in Iran.

3.2.3. Oxford's (1990) Strategy. Inventory for Language Learning (SILL)

The SILL (version 7) was employed in the current study to collect the data. It is a valid used strategy questionnaire developed by Oxford (1990) with the purpose to determine the problem and discover the frequency of LLS (Chamot, 2019). SILL is a self-report instrument comprised 50 items in six major categories. Each category contained several items: (a) memory strategies utilized for storing and retrieving data (9 items), (b) cognitive strategy employed for comprehension and production (14 items), (c) compensation strategy aimed to address boundaries in linguistic knowledge/performance (6 items) (d) metacognitive strategy aimed to plan, organize and monitor learning (9 items), (e) affective strategy exploited to control motivation and emotion (6 items), and (f) social strategies applied for interactive cooperation (6 items). It employed a five-point Likert type ranging from 5 (always or almost always true of me) to 1 (never or almost never true of me). The score in a complete SILL ranged from 50 (minimum) to 250 (maximum). Many studies documented the reliability coefficients for the SILL ranging from .85 to .98. The findings made it a valid instrument for uncovering learners' strategy use. Oxford and Nyikos' (1989) study yielded a satisfactory Cronbach alpha of .96. Hsia and Oxford (2002) CFA reported a good match among the sub-sets. To collect the data, the Persian version of the SILL was utilized. Tahmasebi (1999) assessed SILL and normed the questionnaire for the Iranian context. Tahmasebi alluded that the questionnaire was appropriate for measuring LLSs among Iranian learners. The translated version enjoyed reliability of .91.

3.3. Procedure

The data were collected at two different but interactive phases: *a preliminary and the main phase.* At the initial stage, a method of analyzing the interrelationships among constructs and latent variables was employed. More clearly, the SEM was used as a set of data analysis tools to visualize the hypothesized model, to create a *path diagram* based on the theoretical underpinnings, and to test the theoretically driven hypotheses about linear association among the variables. It was used as *confirmatory modeling* to test

the structural relationship and to investigate the effect of observed and unobserved constructs. Eventually, a hypothetical model was generated and tested in terms of reliability and validity. At the main phase, different questionnaires, including Schommer's (1990) EBQ, Taguchi et al. (2009) L2MSSQ, and Oxford's (1990) SILL were distributed among the target participants. The researchers were personally addressed by official letters from the department of education. All questionnaires were delivered in person. The subjects were expected to fill out the instruments during their class time, which took 15 minutes on each average. To avoid fatigue, the instruments were speared at different intervals. A total number of 900 questionnaires were distributed over four months in 16 weeks in May 2019. Attempts were made to clarify the main objective of the study and asked for the permission and collaboration of teachers. Informed by Cooper and Schindler's (2001) guidelines, the researchers employed some strategies to maximize the response rate (e.g., stressing the importance and benefits of the findings, making promises of anonymity, organizing various rounds of follow-up to request returns, and providing reinforcement to respond). After collecting the data, all questionnaires were screened for incomplete responses or sample attrition. Of all instruments, 126 questionnaires (14%) were not qualified for the analysis because they were incomplete or returned late. Notably, 774 questionnaires (86%) met a valid response rate of 95 percent. This underpins Fogelman's (2002) guidelines for an acceptable survey response rate. Fogelman proposed that a response rate of 60% or higher should be evaluated excellent in most studies. Thus, all the valid data were submitted to the analysis of moment structures (AMOS) version 21.

3.4. Data Analysis

This research is a non-experimental study classified as descriptive research with the correlational method in terms of data collection. To comply with the objectives, two types of analyses were employed: *Correlational and SEM* analyses. The former was to measure the correlation coefficients, and the latter was to examine the causal relationship among the variables. Creswell (2014) proposed two types of correlation study: Explanatory and predictive design. Following Creswell's classification, this study used *predictive design* to anticipate an outcome utilizing some variables as predictors. Accordingly, several assumptions were met to check the normality of the constructs. The data were analyzed at different interactive phases: *First,* a descriptive statistic was run to measure the central tendency of each variable, including mean, standard deviation with the minimum and maximum indices. *Second,* to screen the statistical assumptions, the outlier data were gouged using *Skewness, Kurtosis, and Box plot*. *Third,* a Mahalanobis Distance (MD) test was run to eliminate the outlier data, and to develop the linear regression model. It revealed that some cases (N = 15)

were the outlier from the subject pool. Therefore, a total of 774 questionnaires could meet the criteria for analysis. Next, the datasets were submitted to AMOS, one of the popular programs for the SEM (Song et al., 2016). To undertake SEM, Pearson correlation matrix, Average Variance Extracted (AVE), and Composite Reliability (CR) were employed to probe the convergent validity of the model and to examine the possibility of conducting a conceptual model. To specify the adequacy of the final model, different types of *goodness-of-fit indices were checked. Notably,* the common indices included *the comparative fit index (CFI), normed-fit-index (NFI), and the root mean square error of approximation (RMSEA).* The results revealed that all components were significant at $p > .05$ for AVE and $p > .07$ level for CR. To put it simply, all instruments confirmed internal consistency as far as AVE and CR were concerned. In the current study, the maximum likelihood method was utilized for the estimation of parameters.

4. Results and Discussion

4.1. Results

4.1.1. Correlational Analysis

To answer the first research question, stating that if there is any significant relationship among EB, LLSs, and L2MSS, the Pearson correlation matrix was run. Before pursuing the SEM analysis, the data sets were screened to determine the missing data. In current data, the missing values were scattered through three constructs and twelve sub-factors. Following Song et al. (2016), guidelines on the application of SEM, the *expectation-maximum algorithm* was adopted for the missing values instead of listwise deletion. Since modification indices cannot be preceded with the missing data, the *expectation-maximum algorithm* was used as a common approach in SEM analysis (Byrne, 2001). The descriptive statistics of the constructs are presented in Table 1.

The mean score and the standard deviation for each construct are as follow: EB ($M = 81$; $SD = 12.25$), L2MSS ($M = 61.7$; $SD = 13.19$), and LLSs ($M = 127.03$; $SD = 8.74$). Among the sub-factors, Knowledge ($M = 45.9$), purposeful effort ($M = 16.7$), and cognitive strategy ($M = 33.1$) had the highest mean rank. An average item core was computed due to the diversity of the sub-factors in the questionnaires. The sub-factors ranged from 2 to 6 for each construct. Table 2 reveals the correlation coefficients among the constructs.

Table 1

Descriptive Statistics of EBs, L2MSS, and LLS

Sub-factor	N	Mean	Std. deviation
Knowledge	285	**45.9**	5.8
Learning agent	285	40.6	4.3
EB	285	81.0	12. 25
Ought-to self	285	15.3	4.8
Ideal-self	285	14.9	3.3
Purposeful effort	285	**16.7**	5.7
Learning experience	285	15.0	4.1
L2MSS	285	61.7	13.19
Memory	285	24.3	3.6
Cognitive	285	**33.1**	2.8
Compensatory	285	15.9	2.3
Metacognitive	285	19.7	1.2
Affective	285	18.0	1.4
Social	285	15.7	1.2
LLSs	285	127.03	8.74

Table 2

Pearson Correlation Matrix among EBs, L2MSS, and LLS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	*.82	1													
3	*.62	*.51	1												
4	*.15	*-.16	*-.19	1											
5	*.19	*-.20	*-.20	ᵏ.29	1										
6	*.21	*-.20	*-.17	ᵏ.45	*.	1									
7	*.30	*-.26	*-.23	ᵏ.38	*.	*.40	1								
8	*-.31	*-.32	*-.25	ᵏ.54	*.	*.54	*.68	1							
9	*-.19	*-.19	*-.17	*13	*.	*.74	*.22	.27	1						
10	*-.17	*-.18	*-.18	ᵏ.18	*.	*.70	*.19	.25	.51	1					
11	*-.30	*-.27	*-.26	ᵏ.25	*.	*.20	*.22	.31	.43	.43	1				
12	*-.26	*-.26	*-.21	ᵏ.25	*.	*.41	*.18	.25	.35	.50	.48	1			
13	*-.23	*-.20	*-.22	ᵏ.11	*.	*.17	*.24	.29	.48	.52	.68	.51	1		
14	*-.22	*-.26	*-.37	ᵏ.22	*.	*.20	*.19	.27	.66	.65	.68	.40	.63	1	
15	*-.21	*-.28	*-.33	*.17	*.24	*.21	*.26	*.42	*.74	*.40	*.46	*.51	*4	*64	1

*p< .01;F: factors; 1. Knowledge; 2. Learning agent, 3. EB; 4. Ought-to-self; 5. Ideal-self; 6. Purposeful effort; 7. Learning experience; 8. L2MSS; 9. Memory; 10. Cognitive; 11. Compensatory; 12. Metacognitive; 13. Affective; 14. Social; 15. LLSs

Table 2 indicated that there is a negative and significant correlation between total EB and LLSs (r = -.28, p < .01). To put it differently, students will employ fewer LLSs when their EB increases. Besides, the results from L2MSS and LLSs showed that there is a positive and significant relationship between L2MSS and LLSs (r = .42, p < .01). This coefficient value indicates that students' L2MSS promote their LLSs use.

4.1.2. Structural Equation Modeling Analysis

The *second* research question aimed at probing if EB has a significant direct effect on students' LLSs. To investigate the direction, a path analysis was performed. Accordingly, different fit indices, (i.e., *RMSEA, AGFI, NFI, and CFI*) were run. Table 3 indicates goodness-of-fit indices of the model fit before revision and after two stepwise corrections proposed by AMOS.

Table 3

Goodness-of-Fit Indices of the EBs, L2MSS, LLSs after Two Stepwise Corrections

Fit index	Description	Preference Value	Obtained value before revision	Obtained value after revision
X^2/df	Cayenne Relative	<3	3.142	2.741
X^2	Chi-square goodness of fit test	-	297.638	221.067
Df	Degree of Freedom	-	89	87
RESMA	Root Mean Square Error	<.1	.064	.043
AGFI	Absolute Goodness of Fit	. ≥ .90	.942	.992
NFI	Normed Fit Index	. ≥ .90	.894	.986
CFI	Comparative Fit Index	. ≥ .90	.901	.974

(RMSEA), (AGFI) (NFI), (CFI).

Table 3 indicated that *RMSEA* (.064) falls within the acceptable fit threshold (p < .01). Likewise, all the fit indices, *AGFI* (.942), *NFI* (.894), *CFI* (.901), and the chi-square/df ratio (2.74), were within the guideline level proposed by Schreiber, Nora, Stage, Barlow, and King (2006). Thus, the hypothetical model illustrated an acceptable fit with the empirical data after two stepwise modifications proposed by AMOS. To determine the effects of EB and L2MSS on LLSs, the maximum likelihood estimation (MLE) method was run. MLE is the most possible given data and the assumptions about the distribution from a sample (Byrne, 2001). Table 4 shows the result of MLE for LLS.

Table 4

Direct Maximum Likelihood Estimation for LLSs

Variable	Unstandardized Coefficients B	Standardized Coefficients B	R^2	t	Sig.
EB	.-482	-.380	.183	5.739	.001
L2MSS	.271	.187	.051	4.360	.001

Table 4 indicated that all the dependent variables were significantly predicted by LLSs: Standardized coefficients for EB (β = -.380, p< .01) and L2MSS (β = .271, p< .01). In addition, R^2 for the EB (R^2 = .183) and L2MSS (R^2 = .051). Notably, the finding revealed that EB reduced LLSs for 38%, and L2MSS strengthened LLSs for 18% at p <.01. To provide a better representation of the interrelationship of the constructs, Figure 1 represents the schematic illustration.

Figure 2

Standardized Tested Model and Interrelationships among EB, L2MSS, and LLS

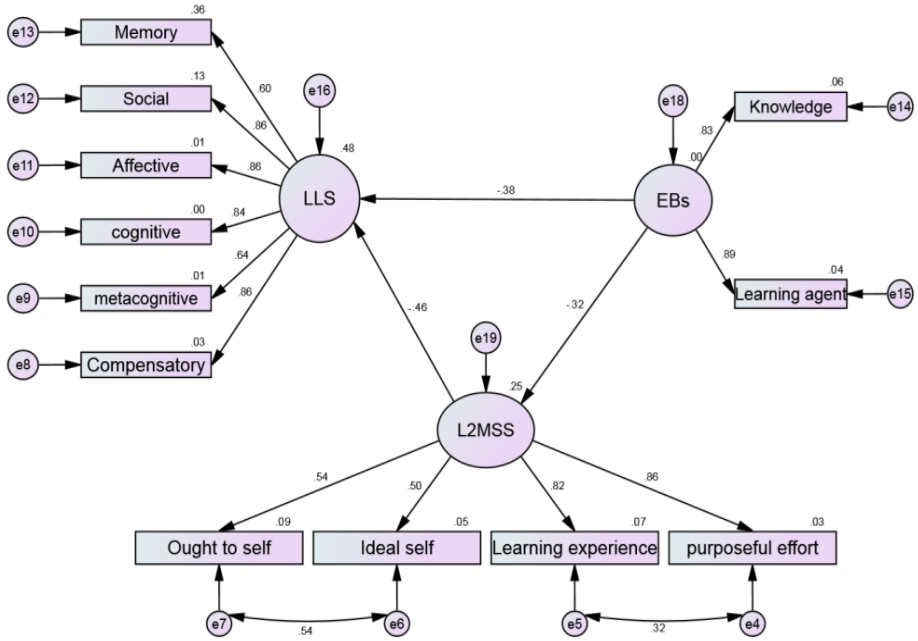


Figure 2 indicated that the sub-factors of EB and L2MSS are the strongest predictor of LLSs in a negative and positive direction, respectively. This showed that when students' EB increases, their LLSs will decrease. Also, when students' L2MSS increase, their LLSs will increase accordingly.

The *third* research question investigated if EB with the mediating role of L2MSS has a significant indirect effect on students' LLSs. In so doing, the *bootstrapping regression model* was run (Table 5).

Table 5

Bootstrap Estimate of Indirect Effect of EB on LLSs with Mediating L2MSS

Variable		Lower Limit	Upper Limit	Sig.
EB with mediating L2MSS on LLSs	487	.271	.592	.001

Table 5 indicated that the standardized Beta coefficients (β = .487, the Lower Limit= .271; Upper Limit= .592, $p < .05$). Regarding the bootstrap estimate of the indirect effect, the results indicated that the path coefficient for EB with the mediating role of L2MSS was significant on LLSs. In short, the path analysis can predict 48% of LLSs both directly and indirectly.

4.2. Discussion

The present study employed an SEM approach to explore the interrelationship among high school students' EB, LLSs, and L2MSS. This study suggests that EB, with the mediating role of L2MSS, has an indirect effect on LLSs. The correlation coefficients among the constructs revealed that EB positively correlated with the sub-factors of L2MSS. However, the findings indicated that the components of EB negatively correlated with LLSs. The results showed that learners' EB was the robust predictor of L2 learning strategies in a negative direction. To put it simply, the student who imagined their EB as a competent person employs less LLSs. The results also indicated that learners' L2MSS was the strongest predictor of L2 learning strategies in a positive direction. In other words, L2 learners employed more LLSs when their L2MSS increased. Several other studies (e.g., Al-Hoorie, 2018; Busari, 2018; Papi et al., 2019; Lila, 2016) also specified L2MSS as the strongest predictor of the language learning experience. All in all, the standardized tested model and interrelationships among the constructs revealed that the exogenous variable was 48% capable of predicting LLSs. The findings corroborate the prior claims by L2 practitioners (Griffiths, 2018; Oxford, 2017; Winberg, et al., 2019) that the types of strategies learners employ depend on the positions of learners' beliefs. The findings of current the study also support the idea that learners' beliefs have unique impacts on the strategies they employ. This finding is consistent with previous studies that were related to learners' beliefs and learning strategies (e.g., Aditomo, 2018; Bendixen, & Feucht, 2010; Cohen, 2018; Hofer, 2016; Osiochru, 2018).

Some other studies (e.g., Bellad, et al., 2019; Habók & Magyar, 2018; Takeuchi, 2019) also supported the claim that learners' beliefs and the strategies they employ are related to their academic achievement. The results of the present study echo Schommer's (1990) findings that students with simplistic beliefs prefer to oversimplify conclusions and choose simple learning strategies. Additionally, those who are less likely to believe simple knowledge and fixed ability can act better on their academic achievement. In line with this study, Ryan (2009) concluded that learners with simple knowledge use *fact-oriented* procedures, and students with sophisticated knowledge use *context-oriented processes* in comprehending a text. Ryan posited that students who have simple knowledge use recall of information, and students with complex knowledge use paraphrasing to specify their comprehension. To endorse this claim, the finding of the current study revealed that learners' EB influences how they plan to study and how to select the type of strategy they employ in learning a language.

Among the sub-factors of EB, both *knowledge and learning agent* were negative predictors of the type of strategies students put into practice. It implies, if learners theorize that scientific findings are complete, they assume no possibility of error in them. In the same vein, if they posit that the learning ability is fixed, they should abstain from continuing actions to learn. Thus, they will have lower academic achievement. These results are in congruence with L2 professional researchers (King & Kitchener, 1994; Osiochru, 2018), who hypothesized that the beliefs held by the learners could promote academic success. The findings also advocated Schommer and Walker (1995), who proposed that students' beliefs can be modified when they reflect on a specific domain. It ratifies the claim made by researchers (Bellad, et al., 2019; Chinn et al., 2014; Schommer, 1990) in that EB may vary across disciplines and does not apply from one domain to another. Contrary to Hofer and Pintrichs' (1997) ideas about EB, students' reflection on the specific domain echoes Hammer and Elby (2002) conceptualization of the importance of *domain specificity* of the beliefs about knowledge. Hammer and Elby posited that students might have numerous epistemic resources that are context-bound. In general, the findings indicated that the sub-factors of EB are interwoven with the core of education and learning knowledge. Many researchers (e.g., Chen & Bager, 2016; Bellad et al., 2019; Papi et al., 2019; Hofer & Pintrich, 1997) have corroborated that EB a play a crucial role in language learning strategies, motivational beliefs, and academic achievement. Lin et al. (2012) investigated the interplay among high school students' motivational and epistemic beliefs. The results ended with the conclusion that those who had stronger beliefs about changeable knowledge (lack of knowledge) were not successful in their learning strategies. This follows the findings of different studies (Aditomo, 2018; Hofer, 2016). They underscored

students who believed that knowledge was simple rather than complex, directed by authority instead of making an inference, and certain rather than transitional would like to incorporate different strategies such as getting ready for an exam, memorizing, and evaluating. Accordingly, the findings of the current study revealed that there is a significant negative relationship between dimensions of EB and students' LLSs. The results show that students employ fewer LLSs when their EB strengthens.

The findings of this study indicated that the L2MSS was the strongest predictor of L2 LLSs. This relationship was in a positive direction. The fact that motivation positively influences students' LLSs is consistent with different studies (e.g., Chinn et al., 2014; Guilloteaux & Dörnyei, 2008; Yang et al., 2019). In general, the findings indicated that L2MSS were influential in language learning. In particular, the standardized tested model showed that all the components of the L2MSS correlated positively with the sub-factors of LLSs. This suggests that when students' motivational self-system extends, they employ more learning strategies in L2 learning. In other words, their motivation operates as a motive force to minimize the mismatch between learners' present and ideal selves. The fact that motivation helps learners use different LLSs may affect a sense of academic success.

One dimension of L2MSS dealt with the extrinsic aspect of L2-self, which illustrates attributes projected by others. This aspect echoes Weiner's *attribution theory*, according to which students' previous experience provides a nexus between motivation and learning activities. It can promote learners' self-efficacy and their orientation to be an active learning process. The results are consistent with theoretical assumptions proposed by McDonough (2005), who posited that students' motivation could be promoted by improving learners' self-esteem. Likewise, practitioners (e.g., Liao & Wang, 2018; Papi & Abdollahzadeh, 2012) stated that students could be more motivated to learn when their beliefs and self-efficacy are developed. The findings also credited the *selves' theories and constructivist learning theory* at the theoretical ground and suggested that motivation provided a bridge between learners' self and learning strategies. In the same vein, the findings recapitulated Mercer and Dörnyei (2020), who claimed that the L2MSS creates an exceptional wave of interest. The finding indicated that students' L2-self is an essential factor in L2 learning. This finding corroborates the claims of Chamot (2019) and Cohen, (2018) who postulated that students with high levels of motivation can employ different strategies in the learning process. Moreover, the findings reinforced the claims made by the professional practitioners (Dörnyei, 2020; Dörnyei & Ushioda, 2011) in that the dynamic system in motivation incorporates different constructs concerned

with the learner, learning environment, motivation, learning task, and strategy into a complicated system. Following these practitioners, this study showed that four sub-factors of L2MSS proposed by Tagouchi et al. (2009) correlated positively with the six subsets of LLSs proposed by Oxford (1990). The results follow Dörnyei and Ryan's (2015) conceptualization about the *socio-dynamic* nature of L2MSS. Like with Dörnyei and Ryan, the interrelationship may be temporal and variable. In a similar vein, the findings endorsed Bråten and Olaussen (2005), who claimed that students with higher levels of motivation and self-efficacy intend to have more knowledge beliefs. The findings also are in line with Takeuchi (2019), who claimed that LLSs influence self-directed learning (i.e., self-regulation). Similarly, Oxford (2017) observed that EB with diverse mediating roles (e.g., *self-regulated learning strategies, motivation, LLS, Self-efficacy*) could influence learners' academic performance. This study also validated the theoretical assumption that EB can influence academic motivation and corroborated Hofer's (2016) framework for the learners' beliefs. Hofer developed a framework of how the beliefs held by students could foster the learning process. Hofer postulated that students' EB influences motivational strategy use. Accordingly, this study disclosed that motivation could affect learning strategy in a positive direction.

5. Conclusion and Implications

A straightforward conclusion for the current study is that EFL students' epistemic and motivational beliefs can influence their choice and application of LLSs. The findings illustrate that there is a negative correlation between EB and LLS and there is a positive causal relationship between L2MSS and LLSs. Notably, the current study suggests that the more EB students take, the less likely they adopt a wide range of LLSs. Additionally, the more L2MSS they hold, the more LLS will be employed by students. It seems appropriate that learners' beliefs and motivational systems can regulate EFL learners' learning strategies. The findings suggest that school authorities and EFL teachers foster learners' beliefs to direct them to develop sophisticated beliefs about knowledge and learning process which in turn can pave the ground for the effective teaching and learning. Besides, language policymakers, curriculum, and materials developers should raise students' EB consciousness by including different tasks and activities in their textbooks. To put it differently, students should be trained to take responsibility for their learning. This study was conducted with a large sample size of high-school population. A similar study is recommended to screen the causal effect of the constructs and the subsets of current study among EFL teachers and university students. Moreover, a survey study with observation and interview can be influential in conceptualizing what rational epistemic beliefs and motivational strategies EFL teachers adopt in the natural setting of a classroom.

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