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L2 Teachers' Pedagogical Thoughts: Variations Across Teachers With Varying Levels of Grit

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Teacher pedagogical knowledge base (PKB) has secured a notable position in research on teacher cognition. One obvious gap in this strand of research concerns variations in teachers' thought processes in relation to individual difference variables despite indications that PKB is likely to differ across individual differences. To fill part of the void, this study investigated how teachers' PKB—conceptualized as the frequency and dominance of pedagogical thought units/categories—vary as a function of teachers' levels of grit. To this end, eight EFL teachers (four High-Grit and four Low-Grit) were chosen to participate in the study. Stimulated recall interviews were used to explore the pedagogical thought units that underlie the teachers' instruction. The thought units of the two groups were then identified by segmenting, coding and categorizing them. The results showed that there were significant differences between the two groups of teachers in the number and list of dominant pedagogical thought categories. Language Management, Procedure Check, Affective, Self-Reflection, Progress Review, Beliefs, and Problem Check constituted the list of dominant PTCs of High-Grit teachers, whereas Low-Grit teachers' dominant thought categories included Language Management, Procedure Check, Time Check, Progress Review, and Problem Check. The results advance the scholarship on teachers' PKB by extending the findings to individual differences.

Keywords: pedagogical knowledge base, thought units, thought categories, teacher grit, EFL instruction

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INTRODUCTION

Prior to the 1970s, the mainstream teacher education was generally dominated by a perspective that subscribed to the so-called process-product conceptualization of language education (Dunkin and Biddle, 1974; Akbari and Dadvand, 2014; Karimi and Norouzi, 2017). According to this perspective, teachers were viewed as mere implementers of a set of ideas provided to them in teacher training programs and their performance was evaluated primarily in terms of the outcomes it yielded (Freeman, 2002). According to Freeman (2002), learning to teach entailed knowing what content to teach and also how to teach it to students. The major aim followed in teacher education programs within this perspective was to identify the specific "desirable" teaching behaviors that were thought to lead to better student achievement and, subsequently, to prepare teachers to adopt these behaviors in their classes (Verloop et al., 2001). As evident above, teaching was principally viewed in terms of a transmission mode through which teachers transferred the content through specific techniques in the hope of better student learning (Freeman and Richards, 1996).

The picture portrayed above provides a general characterization of mainstream teacher education; however, it was largely true for *language* teacher education as well. As posited by Gatbonton (1999), much of the "theoretical" basis for second language teacher education courses were based on studying classroom processes, known today as "public activity," which included publicly available classroom events, interactions, routines, and behaviors (Burns et al., 2015). This simplistic conceptualization of language teaching, which overlooked the teachers' thought processes, was soon questioned by professionals who thought that the perspective presented a myopic and short-sighted view of teaching and reduced a complex activity to only a handful of quantifiable behaviors (Freeman and Johnson, 1998). This reaction was motivated by acknowledgments of the "mental lives" of teachers (Walberg, 1977).

Furthermore, it was discovered in the 1990s and early 2000s that a body of knowledge guides L2 teachers' classroom instructional behaviors; as a result, research on L2 education has shown that the L2 teachers' knowledge base urgently needs re-conceptualization (Freeman, 2002). Inspired by such advancements in the way teaching was conceptualized, research on teachers' thought processes, knowledge and beliefs—collectively labeled "teacher cognition" that form the bedrock for their instructional decisions—gained increasing momentum. Each of these sub-constructs has been extensively investigated in the literature. Teacher pedagogical knowledge base, defined as thought units that teachers use during instruction (Gatbonton, 1999), has also secured a special locus in research on teacher cognition. The initial research (e.g., Gatbonton, 1999; Mullock, 2006) focused on delineating and outlining the categories of teacher thoughts that underlie teachers' instruction and classroom approach. Subsequent studies within this line of research investigated differences in the pedagogical thought units (PTUs) of teachers in relation to a number of *professional* variables such as education or expertise levels (e.g., Akbari and Dadvand, 2011; Karimi and Norouzi, 2019).

One noticeable lacuna in this line of research concerns variations in teachers' thought processes in relation to individual difference variables despite the indications that PKB might vary across individual differences such as personality (Gatbonton, 1999). When teachers' individual differences affecting teachers' decision-making, thinking, and pedagogical reasoning are identified, specific language teacher education initiatives can be designed and launched which can target specific groups of teachers with a certain set of characteristics. To this end, a vibrant line of research should investigate teacher thinking in relation to various teacher variables to establish a body of knowledge guiding the designing and implementing of teacher education initiatives.

Parallel with the recognition of teachers' mental lives, introducing the principles of teacher psychology into language teacher education has sparked an interest in individual differences in relation to teachers after being eclipsed by emphasis on differences in learner characteristics for long (Mercer, 2018). According to Mercer (2018), teacher psychology can provide a window into the varied socio-cognitive processes that characterize the complex milieu of a language classroom. Teachers' psychological characteristics, particularly characteristics that involve "commitment and resilience in the face of adversity" (Duckworth et al., 2009, p. 540), can contribute to the more effective teacher performance in classroom. However, the study of such characteristics in relation to teachers' cognitive reasoning, as a strong predictor of teacher effectiveness, has been essentially lacking.

One such variable is teacher grit, defined as heightened perseverance and passion for overcoming challenges and expending sustained efforts and enthusiasm despite failures and inadequate progresses made (Duckworth et al., 2007). Grit entails self-regulation, which serves to organize teachers' cognitions, social interactions, and emotions to achieve higher, more long-term goals that may take years to attain (Duckworth and Gross, 2014). The concept has been investigated in relation to performance in a variety of contexts such as military, workplace and school contexts (Eskreis-Winkler et al., 2014). However, despite being a significant factor in pedagogy, which can potentially affect the pedagogical performance of teachers (Duckworth and Quinn, 2009; Moè, 2016), the concept has not received adequate research attention in relation to teachers' cognitive performance. Therefore, the present study investigated how teachers' knowledge base—conceptualized as the frequency and dominance of cognitive thoughts/categories—vary as a function of teachers' levels of grit. More specifically, the study attempted to answer the following research questions.

Research Questions

1) Are there any significant differences in the types (dominance) of pedagogical thought categories (PTCs) across high-grit (HG) and low-grit (LG) groups of teachers?
2) Are there significant differences in the number of thought units per dominant thought category across HG and LG groups of teachers?
3) Are there any significant differences in the overall number of pedagogical thought units produced by HG and LG groups of teachers?

LITERATURE REVIEW

The Concept of Grit

Today, teacher psychology goes beyond the individualistic view and concerns to maintain a more holistic perspective linking psychological and cognitive dimensions such as affection, motivation, and cognition (Mercer, 2018). Discovering the psychological aspects of teachers has always been of interest to researchers working in the field of teacher cognition and teacher education (Nazari and Alizadeh Oghyanous, 2021). Teacher grit, which is one of the outstanding individual difference variables, can potentially impact teachers' cognition and their performance (Nazari and Alizadeh Oghyanous, 2021) given the perseverance and passion implicit in the concept.

Grit is defined as "trait-level perseverance and passion for long-term goals, which can predict achievement in challenging domains over and beyond measures of talent" (Duckworth and Quinn, 2009, p. 166). Duckworth et al. (2007) maintain that grit

entails taking decisive actions to overcome challenges, expend sustained efforts, and maintain passion for a goal, encouraging the individual to keep moving forward despite failures and difficulties. The definition implies two main elements of grit: "consistency of interests and perseverance of effort" (Duckworth and Quinn, 2009, p. 172). The former refers to sustained attention to activities and practices in the long term and the latter highlights individual resistance against failures that are likely to come in the way of achieving goals. The concept of grit has received substantial attention in positive psychology—an academic discipline aimed at finding ways to improve the quality of life. Grit is also known, both in academic and non-academic environments, as knowledge that encourages individual activism (Duckworth, 2016). A number of researchers have pointed out that gritty individuals are more successful and outperforming compared to individuals with lower grit levels (Duckworth et al., 2007; Mueller et al., 2017). As a general and malleable construct, grit has been investigated in a number of domains. For example, the United States Department of Education has allocated funds for programs promoting a sense of grit in inefficient and non-standard schools. A number of institutes have stepped beyond and rewarded the gritty students (Cohen, 2015). Grit is also considered an effective construct for inspiring investments and sales jobs. Studies have shown that perseverant salespeople outperform their counterparts in their careers and have a higher job satisfaction rate than their counterparts with a lower level of grit (Dugan et al., 2019).

There is substantial evidence suggesting that grit can enhance performance levels and creativity in different organizations and institutions. Research on the relationship between grit and innovation in an entrepreneurial context showed that these two constructs are likely to ensure business success (Mooradian et al., 2016). Mueller et al. (2017) prepared a list of 204 people with different jobs to investigate the effect of passion and grit on organizational performance. The results indicated that there was a connection between entrepreneurial passion and grit and desired business outcomes. The concept of grit has also attracted research attention in health care. Research on grit, anxiety and stress in physicians of the Emergency Department of an urban medical center revealed a close correlation between anxiety and stress, but no significant relationship was found between grit and such negative feelings (Wong et al., 2018).

Grit can also provide considerable insights into the process of second language acquisition. The reason is that a fundamental share of academic achievement in successful language learners hinges on their sustained efforts (Dornyei and Ushioda, 2010). Besides their resolution to learning a second language, these students possess a passion for speaking the target language and are more interested in classroom events and participation in discussions (Teimouri et al., 2020). Furthermore, gritty students are less impatient in the classroom, are more motivated than others, try to learn the second language as effectively as possible, and enjoy the experience of second language acquisition (Duckworth and Quinn, 2009; Changlek and Palanukulwong, 2015; Dörnyei and Ryan, 2015). Moreover, according to Shechtman et al. (2013), there is a positive correlation between students' success and their grit. Even though learner grit has received much theoretical and empirical attention (Shechtman et al., 2013), teacher grit, a non-cognitive teacher-related variable, is an underrepresented topic. There is still insufficient knowledge on teacher grit. In the following section, we provide an account of teacher grit, in general, and L2 teacher grit, in particular.

Teacher Grit and L2-Teacher Grit

As implied above, grit, as a new-developed personal trait, is assumed to predict attainment in a wide array of contexts since it entails sustained efforts and persistence to reach long-term aims (Silvia et al., 2013). Grit has been extended to teacher performance as well. Teacher grit concerns the level of perseverance, dedication, and passion that the teacher feels toward working with his students to reach their aims (Duckworth et al., 2007; Duckworth and Quinn, 2009; Robertson-Kraft and Duckworth, 2014). Duckworth et al. (2009) examined why a number of teachers are evidently more effective than others. Three-hundred-ninety teachers were recruited for the study. The findings suggested that grit could be an initial contributor to the efficiency of a teacher. They concluded that "positive traits should be considered in the selection and training of teachers" (Duckworth et al., 2009, p. 540). According to Robertson-Kraft and Duckworth. (2014), grittier teachers tend to have a more effective professional performance than their less gritty counterparts.

Specifically, the level of success in English language teaching can be ascribed to a range of factors, including personality, education, timing, connections, risk-taking propensity, among others. The importance of grit must not be overlooked since each of these traits might contribute to the success or failure of an L2 educator (Sudina et al., 2020). In EFL, whether in the context of EFL or ESL, several elements may put to test the passion and perseverance of a teacher, including low wages, job insecurity, linguistic challenges, cultural differences, increased workload, and level of confidence of teachers (Sudina et al., 2020). Therefore, the role of grit in language teachers' instructional performance should be deemed worthy of empirical consideration as several studies have focused on the psychological aspect of language teachers' work (such as Mercer and Kostoulas, 2018).

Teacher Cognition in Language Education

In the behavioral tradition of research in teacher education, no place could be found for teachers' critical thinking and cognition (Shulman, 1987). Teachers were expected to enter the teaching profession with a clean slate, and to learn the requisite teaching skills and habits through training initiatives. Such a conceptualization had no place for teachers' mentality, and this was motivated by the universal understanding that teachers' mental lives were thought to be basic (Freeman, 2002). For good reason, such outmoded, simplistic perceptions of teaching have been put aside, and behaviorist conceptions of instruction have been replaced with the cognitive/social views of teaching (Johnson, 2006). Walberg (1977) advocated for a more mentalistic understanding of teaching and teacher

development. To explain the hidden cognitive aspects of teaching, he coined teachers' mental lives. Teaching has been argued to be a complex mental activity in which teachers are active thinkers who use sophisticated, practical, individualized, and contextualized bodies of knowledge, thoughts, and beliefs to make instructional decisions (Borg, 2003).

Teacher cognition as defined by Borg (2003, p. 81) concerns "the unobservable cognitive dimension of teaching–what teachers know, believe and think." It comprises all dimensions that influence teachers' mental lives and the components that influence teachers' understanding of teaching. It also encompasses all of the considerations on how teachers teach and the rationalizations that they offer for their instructional decisions. It was in the 1990s and, more specifically after 1996 that significant inquiry into teachers' mental lives started in language teaching. The concept has attracted substantial research attention in L2 teacher education and has turned into a vibrant line of research in applied linguistics. The flourishing of investigations into teachers' cognitions is rooted in their impact on their decision and practices (Karimi and Asadnia, 2022). Guided by these theoretical assumptions, a body of research emerged which examined the thought processes underlying teachers' instructional decisions, their beliefs, and knowledge informing teacher functioning (Borg, 2003). Investigations into teachers' pedagogical knowledge base, defined as a body of knowledge about teaching, including goals, processes, and methods that serve as the foundation for what teachers perform in the classroom (Mullock, 2006), have also secured a special locus on the agenda of research on teacher cognition. In the next section, we will provide an overview of the studies, which have examined teacher pedagogical knowledge base in L2 instruction.

Research on Pedagogical Knowledge Base (Thoughts Units Informing Practice)

As discussed above, in the behavioristic characterization of teacher performance, teachers' thinking was basically absent (Karimi and Norouzi, 2017). Gradual recognition of teachers as thinking individuals who function on the basis of a wide-ranging and intricate web of pedagogical thoughts gave rise to vibrant strands of research investigating various dimensions of teachers' mental lives. Among other strands, one line of research has set out to uncover, delineate and explain the behind-the-scene pedagogical thoughts of teachers referred to as knowledge base (Gatbonton, 1999; Mullock, 2006).

As a pioneering study in this line of research, Gatbonton (1999) investigated the pattern of thought units that undergirded experienced ESL teachers' classroom instruction. Utilizing a think-aloud technique, the researcher investigated the thoughts that experienced ESL teachers reported to have had in their mind during instruction while watching their own video-recorded classroom instruction. Quantitative and qualitative analyses of the verbal reports revealed 20 to 21 categories of pedagogical thoughts that underlay teacher's instructional performance. Seven to eight categories of thoughts were found to form the dominant categories that informed teachers' instruction. These categories included Language Management (20%), Knowledge of Students (9%), Procedure Check (8%), Progress Review (8%), Beliefs (7%), Noting Students' Reactions and Behavior (6%), and Decisions (6%). This study and the coding scheme developed therein paved the way for subsequent investigations into the pedagogical thought units in other populations of teachers and in relation to other variables.

Mullock (2006) partially replicated Gatbonton's (2000) research and examined the pedagogical knowledge base of four language teachers with various experience in TESOL who taught four intact classes (from low intermediate to advanced level students) in real-life teaching environments, as opposed to teaching in research contexts. They taught Cambridge Advanced Certificate courses in General English, Business English, and Advanced English. The results replicated those of Gatbonton's, but there were a few subtle differences. Predictably, Language Management was the major category of thoughts reported by the teachers, followed by Knowledge of Students, which was significantly higher compared with that in Gatbonton's study. Other prominent categories were Procedure Check, Progress Review, and Note Student Reaction and Behavior, which differed from Gatbonton's findings with regard to ranking.

Gatbonton (2008) also analyzed the pedagogical knowledge base of novice ESL teachers, who reported the thoughts that they drew upon during teaching. The study's main goal was to investigate the pedagogical knowledge, which the teachers had internalized after attending a teacher training program and to compare the findings with the experienced teachers studied in Gatbonton (1999). The findings indicated that pedagogical knowledge of novice and experienced teachers was approximately similar, although there were differences in the details of each category. The findings further showed that novice teachers were able to acquire the pedagogical knowledge that informs classroom instruction. Nevertheless, they were thought to need more hands-on experience and time to develop the ability to realize such knowledge in practice. The findings supported the conclusion that teacher training can accelerate the acquisition of expertise and knowledge required for more effective classroom functioning and teachers should not have to wait for such knowledge to be accumulated by long-term practice and experience.

To extend the previous research to educational background, Akbari and Dadvand (2011) examined variations in the pedagogical thought units of teachers who varied with regard to the level of formal education. Eight EFL teachers participated in the study (four MA and four BA holders). Though both groups showed similar PTCs, there were significant variations between the two groups in the frequency and ranking of their occurrence. The findings revealed that teachers holding Master's degrees reported approximately twice as many pedagogical thoughts as their Bachelor's colleagues did, where *Affective* showed the maximum level of difference in its frequency.

In a similar study, Karimi (2011) analyzed the pedagogical thought categories of six teachers according to their teaching license status including two alternatively licensed, two standard-licensed, and two non-licensed teachers. The results showed significant variations in the pedagogical thought categories across these three groups. The most common pedagogical thought units reported by standard-licensed teachers were

Affective, Language Management, Self-Reflection, Procedure Check, Beliefs, and Progress Review. On the other hand, the main pedagogical thought categories for alternatively licensed teachers were Affective, Language Management, Progress Review, and Procedure Check. Procedure Check, Language Management, Note Behavior, and Progress Review also constituted the main pedagogical thought categories of non-licensed teachers. The results also revealed that the standard-licensed teachers produced the highest number of thought units, followed by alternatively licensed teachers and non-licensed teachers.

Karimi and Norouzi (2017) also examined growth in the PKB of novice L2 teachers as a result of expert mentorship programs. The teachers' instructional performances were video-recorded prior to and after mentoring programs and used as stimuli to elicit thoughts underlying their instructional moves. The findings revealed significant differences in the frequency with which they produced PTUs as well as the relative dominance of the PTCs. The authors concluded that expert mentoring initiatives could be used as effective means for developing novice teachers' pedagogical knowledge. In a recent study, Karimi and Asadnia (2022) also investigated the differences between the pedagogical thoughts of novice and experienced teachers in tertiary-level online instructional contexts and the antecedents of their thoughts. The findings showed significant differences in the PTCs of the two groups of teachers. The findings also indicated that experienced teachers' PTCs were guided by cognitive and social sources. In contrast, novice teachers' pedagogical thoughts were principally cognitively oriented.

As a review of the literature reveals, attention to teachers' PKB in relation to individual differences in essentially lacking and further research is required to shed light on how teachers' pedagogical thoughts vary as a function of individual differences.

MATERIALS AND METHODS

Participants

Eight English as a Foreign Language (EFL) teachers were purposively selected as the target participants after administering the L2 Teacher Grit Scale to a larger pool of teachers (N = 70). Their informed consent was sought. Four of the teachers possessed high levels of teacher grit whereas the other four had low levels of teacher grit based on their performance on the grit scale. The two groups were similar in terms of gender composition: one male and three female teachers per group. Moreover, the two groups were kept homogenous in terms of the academic degrees they held (all held Master's degrees). Furthermore, both groups were very similar in terms of teaching experience (HG group: M = 8.25, SD = 1.70; LG group: M = 8.50, SD = 2.64). In addition, the level of the class, the course book taught, and the sections to be covered in the recorded sessions were kept the same.

Instruments

L2 Teacher Grit Scale

The L2 Teacher Grit Scale (L2TGS) developed by Sudina et al. (2020), was used to measure teachers' level of grit. This scale included nine items rated on a five-point Likert scale that ranged from "*Very much like me*" (5) to "*Not like me at all*" (1). Two sub-factors, the perseverance of effort and consistency of interest are measured by the scale. The items that measure the subscale's consistency of interest are scored in reverse order. The internal consistency of the scale was α = 0.77 (α = 0.71 for perseverance of effort and α = 0.70 for consistency of interest). Furthermore, Sudina et al. (2020) have reported adequate construct, concurrent, and predictive validity for the measure.

Stimulated Recall Interview

Following the lead of previous studies on pedagogical knowledge base (e.g., Gatbonton, 1999, 2008; Mullock, 2006; Akbari and Dadvand, 2011, 2014; Karimi, 2011; Karimi and Norouzi, 2017), teachers were interviewed using stimulated recall technique. Although it has received its share of criticisms with regard to reliability and validity (Davis, 1995), stimulated recall is an effective means for probing into teachers' pedagogical knowledge base since it provides a window into the teachers' online pedagogical reasoning. The method involved videotaping a teacher-led class and conducting a follow-up recollection interview in which the teachers were required to verbalize the thoughts underlying their instruction (Akbari and Dadvand, 2011). In order to enhance the technique's reliability, the researchers observed the suggestions by Gass and Mackey (2000) regarding keeping the gap between thinking and verbalizing as minimal as possible, developing a detailed and clear research protocol and having an independent third party analyze a fraction of the transcripts.

Procedure

Initially, a 90-min classroom instruction by each teacher was video-recorded, which resulted in a total of 720 min of recorded instructional performance. At the end of each class, a meeting was arranged between the teacher and one of the researchers to conduct the interview. During the stimulated recall interview, the researcher initially played the video in the presence of the teacher and paused it for every instructional move to let the teacher verbalize his/her thought(s) underlying the move. All stimulated recall sessions were recorded and subsequently transcribed verbatim. After transcribing the verbalizations, one of the researchers coded and segmented them into pedagogical thought units, which were, in turn, classified into general categories called pedagogical thought categories (see the section on "Data Analysis" for further information). Moreover, following Akbari and Dadvand (2011), we decided to share the purpose behind the verbal protocols and the associated procedure with teachers in order to reduce the likelihood of teachers' undue reading into their pedagogical behaviors.

Data Analysis

In line with the procedures followed in earlier studies on teachers' knowledge base, the participant teachers were interviewed, as detailed above. The transcripts of the interview-based verbal reports of the teachers were analyzed both qualitatively and quantitatively. First, for the qualitative part the interview transcriptions were segmented into minor thoughts, which are

referred to as "pedagogical thought units" (Gatbonton, 1999, p. 38). These thoughts were then labeled and categorized into major thoughts based on their common themes, which are referred to as "pedagogical thought categories" (Gatbonton, 1999, p. 38). Gatbonton's (1999) coding scheme which was expanded on by Akbari and Dadvand (2011) was used to analyze the data.

Example A is part of one piece of the HG teachers' verbal recollections; it exemplifies the process of segmentation and labeling:

EXAMPLE A

"(1) When I use funny pictures to get my students to make sentences and questions, everyone gets involved in that moment and tries to make better sentences. (2)... we laugh a lot at some of the sentences, you know some of the students are so funny and make funny sentences, too and it draws their attention to the class, (3) I have done this activity in my classes from the first years of my teaching career because I got good feedbacks from my students."

This transcribed portion of the verbal recollection is divided into three independent chunks, or thought units (numbered *1–3*), each reflecting a different pedagogical concern.

For instance, in Example A, chunk 1 represents the teacher's management of students' output. It deals with eliciting language from students. It represents thought units that fall under the Language Management category. The second unit discusses how the teacher feels about the students and how she reacts to them. It, more specifically, deals with the teacher's intended to use the students' humor potential, which fall under the Affective category. Finally, the last chunk represents the teachers' revelations of what she did in the past, which is related to Past Experience category.

The analysis of the verbal recollections was not always undemanding and straightforward. There were a number of utterances whose connection to the thought categories were ambiguous since they did not basically reflect the teachers' comments/ideas on their own performance in the classroom (i.e., they were not instructional). Irrelevant comments and thoughts that occurred during the interview or inspired by the researcher were, thus, removed from the analyses. The following thought is an example of an un-instructional thought:

EXAMPLE B

"In the spring, my seasonal allergies start, so I sneezed several times in class and the students kept saying bless you."

Additionally, as quickly cited above, to enhance the reliability of the procedure, a third party was asked to code and segment 25% of the transcripts and the consistency was 94%. The two raters resolved the points of disagreement through consensus. For the quantitative phase of the study, the frequency tallies were subjected to a series of Chi-square tests to examine likely differences across the two groups of teachers.

RESULTS

The frequency of individual thought units, the average number of reported pedagogical thoughts per minute, and the overall frequency of units within the respective categories provided a basis for comparing the two groups of HG and LG teachers. Non-parametric tests of relationship (Chi-square analyses) were conducted to find out whether there were significant differences across the two groups of teachers in the overall number of thoughts that they produced and the number of thought units per thought category. The frequency, ranking, and the percentage of the PTCs of the two groups of teachers are presented in **Supplementary Appendix Tables A, B**.

List of Dominant Thought Categories of High-Grit and Low-Grit Teachers

The first question explored differences in the types (dominance) of PTCs across HG and LG groups of teachers. In line with earlier studies on PKB (Gatbonton, 2000, 2008; Mullock, 2006; Akbari and Tajik, 2009; Karimi, 2011; Karimi and Norouzi, 2017), PTCs with a frequency of at least 6% of the total number of PTUs were regarded as dominant. The list of dominant categories per teacher group is presented in **Table 1**.

As **Table 1** indicates, the dominant thought categories for HG teachers were Language Management (30.59), Procedure Check (11.65), Affective (8.82), Self-Reflection (7.19), Progress Review (6.85), Beliefs (6.42), and Problem Check (6.25). However, the list of dominant pedagogical thought categories for LG teachers were Language Management (41.61), Procedure Check (11.39), Time Check (7.29), Progress Review (7.04), and Problem Check (6.01).

A closer inspection of the list of dominant categories of the two groups of teachers showed that the reported frequencies for Language Management and Procedure Check were the highest and ranked first and second for the two groups. Interestingly, while Affective, Self-Reflection, and Beliefs were the third, fourth, and sixth categories for the HG group, they were not among the dominant categories for the LG group. A notable difference was observed in Time Check category which was absent in the list of dominant categories for the HG group, whereas it was the third category in the LG group's list of dominant PTCs. There were differences in the ranks of Progress Check and Problem Check from the fifth and seventh in HG group to the fourth and fifth categories in LG group.

Comparing Pedagogical Thought Unit Differences Per Dominant Pedagogical Thought Categories Across Teachers

The second research question addressed the probability of any significant differences between the two teacher groups in their PTUs within each dominant PTC. To this end, a series of Chi-square tests were conducted. The results are presented in **Table 2**.

As shown earlier in **Table 1**, for the two groups of teachers, Language Management had the highest percentage of the total number of PTUs. Therefore, the first Chi-square test focused on the likely difference across the two groups in this category. The results, as shown in **Table 2**, revealed no significant difference in the PTUs related to Language Management across the two groups, $\chi^2 = 1.50$, $df = 1$, $p > 0.05$, (HG: thoughts per min = 0.99, LG: thoughts per min = 0.90). The next PTC compared between the two groups of teachers was Procedure

TABLE 1 | Dominant pedagogical thought categories for the HG and LG groups of teachers.

HG group		LG group	
Categories	**Percentage**	**Categories**	**Percentage**
Language management	30.59	Language management	41.61
Procedure check	11.65	Procedure check	11.39
Affective	8.82	Time check	7.29
Self-reflection	7.19	Progress review	7.04
Progress review	6.85	Problem check	6.01
Beliefs	6.42		
Problem check	6.25		

TABLE 2 | The edited table of Chi-square results for differences in the PTUs within the dominant PTCs.

Groups	Pedagogical thought categories	Chi-square	DF	Asymp. Sig.
HG and LG	Language management	1.50	1	0.222
HG and LG	Procedure check	9.81	1	0.002
HG and LG	Affective	49.14	1	0.000
HG and LG	Self-reflect	26.77	1	0.000
HG and LG	Progress review	4.63	1	0.031
HG and LG	Beliefs	26.27	1	0.000
HG and LG	Problem check	5.63	1	0.018
HG and LG	Time check	17.77	1	0.000

Check. This category concerns the attempts to ensure that the lesson proceeds smoothly from the very beginning to the end. The results reveal a significant difference between the two groups of teachers, $\chi^2 = 9.81$, $df = 1$, $p < 0.05$, (HG: thoughts per min = 0.37, LG: thoughts per min = 0.24). The third PTC that was compared across the two groups of teachers was the Affective category. The results of the Chi-square test run to compare the two groups of teachers in the number of PTUs related to this category revealed a significant difference between them, $\chi^2 = 49.14$, $df = 1$, $p < 0.01$, (HG: thoughts per min = 0.28, LG: thoughts per min = 0.06).

Self-Reflection (the teacher's disclosures about herself or himself in reference to attitudes, teaching style, and techniques in dealing with students) was the third category of pedagogical thoughts that was compared. The results of the Chi-square test again showed a statistically significant difference between the two groups of teachers, $\chi^2 = 26.77$, $df = 1$, $p < 0.01$, (HG: thoughts per min = 0.23, LG: thoughts per min = 0.08). For the two groups of teachers, the number of PTUs related to Progress Review was also compared. The results of the Chi-square test to compare the PTUs of Progress Review revealed a significant difference between the two groups of teachers, $\chi^2 = 4.63$, $df = 1$, $p < 0.05$, (HG: thoughts per min = 0.22, LG: thoughts per min = 0.15).

The next PTC that was compared between the two groups of teachers was Beliefs (teachers' perspectives on language learning, language teaching, and language itself), which was only among HG teachers' list of dominant PTCs. The results of the Chi-square test revealed a significant difference between the two groups of teachers in this PTC, $\chi^2 = 26.27$, $df = 1$, $p < 0.01$, (HG: thoughts per min = 0.20, LG: thoughts per min = 0.06). In addition, as it can be seen in **Table 2**, there is a significant difference across the two groups of teacher in the number of PTUs related to the Problem Check (i.e., thoughts on the issues hindering the lesson flow and the challenges that students have with the lesson), $\chi^2 = 5.63$, $df = 1$, $p < 0.05$, (HG: thoughts per min = 0.20, LG: thoughts per min = 0.13).

Finally, Time Check (comments on the time of activities or tasks) was the only category of knowledge in which the LG teachers reported a higher frequency, $\chi^2 = 17.77$, $df = 1$, $p < 0.01$, (HG: thoughts per min = 0.05, LG: thoughts per min = 0.15).

The Overall Number of Pedagogical Thought Units Across High-Grit and Low-Grit Teachers

The third research question probed the possibility of any significant differences in the frequency of PTUs between the two groups of teachers. The Chi-square test revealed that there was a significant difference between the two groups. The results are shown in **Table 3**.

The results presented in **Table 3** indicate a significant difference between the two groups of teachers in terms of the overall number of PTUs that they produced while teaching, ($\chi^2 = 76.48$, $df = 1$, $p < 0.01$). The overall frequencies of the PTUs for the HG teachers and LG teachers were 1167 (the average number of thoughts per minute = 3.24) and 781 (the average of thoughts per minute = 2.16), respectively. Teachers with high levels of grit generated significantly more PTUs compared with teachers with low levels of grit.

DISCUSSION

The results revealed that there is a significant difference between HG and LG teachers in the frequency of PTUs that inform their instruction. HG teachers were found to produce a substantially higher number of PTUs than the LG teachers. HG teachers' higher frequency of PTUs could be taken as emanating from the higher level of perseverance, passion and dedication that are associated with high levels of grit. Higher levels of consistency of interest and perseverance of effort can enable teachers to attend sustainably to the activities and practices that are assigned to them and resist against failures likely to happen in achieving their professional goals. Duckworth et al. (2011) believe that grit helps people put sustained effort into repetitious, weary, or frustrating behaviors to achieve success. In the case of teachers with high levels of grit, this could be translated into instruction that is backed with a more sophisticated cognitive

TABLE 3 | Chi-square test for the total number of PTUs of HG and LG teachers.

Group N	N	Observed N	Expected N	Chi-square	DF	Asymp. Sig.
HG	4	1,167	974	76.48	1	0.000
LG	4	781	974			

basis, as revealed by the substantially higher number of PTUs reported by them compared with teachers with low levels of grit, which may be accustomed to a more reutilized and humdrum practice.

Although the two groups of teachers shared four thought categories in their list of dominant PTCs (i.e., Language Management, Procedure Check, Problem Check, and Progress Review), these thought categories had a less noticeable manifestation in the LG teachers' cognitive reasoning. Compared to other PTCs, Language Management figured more prominently in the two groups of teachers' thoughts. This category deals with the input that students are exposed to and output that is elicited from them. This may be due to the context of instruction, an EFL context, in which teachers are likely to have, either consciously or unconsciously, conceptualized their role as a language facilitator for students (Akbari and Dadvand, 2011).

A number of thought categories were present among the HG teachers' list of dominant categories whereas they were not present in the LG teachers' list of dominant categories of thoughts. More specifically, it was found that thoughts regarding Affective, Self-Reflection, and Beliefs underlay HG teachers' instructional performance. In contrast, a look at the LG teachers' list of dominant categories reveals that they are more concentrated on Time Management, compared with their HG counterparts. Duckworth et al. (2009) argue that grit can be a strong guarantor of teacher effectiveness. HG individuals have more positive personality traits, including less neuroticism and more extraversion (Duckworth and Quinn, 2009), which may translate into more effective interactions with students in the context of teaching, as shown by the higher number of PTUs related to Affective thought category by the HG teachers. The higher number of affective thoughts produced by HG teachers indicates their greater sensitivity to students' feelings and reactions and their tendency to provide a positive pedagogical environment in which close relationships are established and students are encouraged to take risks. Self-Reflection (teacher's self-expression of interests, teaching style, and strategies for interacting with students) and Beliefs (teachers' perspectives on language learning, language teaching, and language itself) were only seen in HG teachers' list of dominant PTCs. Additionally, significant differences were found between the two groups of teachers in these PTCs. Such frequency differences regarding HG teachers signify the desire and determination to rectify their shortcomings based on self-reflection and refinement of their practices (Kevin et al., 2020).

High-grit individuals have a better performance in challenging situations in which a reasonable person is likely to give up (MacIntyre and Khajavy, 2021). They are also characterized by the tendency to engage in sustained strenuous efforts to achieve a challenging goal, as well as continuous endeavor and interest maintained for a long time despite failures, retreats, and plateaus; and phases of stability in the learning process (Duckworth et al., 2007). The more varied spectrum of dominant pedagogical thoughts displayed by HG teachers and the substantially higher number of their reported thought units indicate that these teachers have been able to maintain their commitment to an interest in teaching over the years (given the participants' teaching experience) despite the demanding nature of the job and in the face of inherent demoralizing hardships and challenges that characterize the profession such as low pays, job insecurity, and workload. As posited by Sudina et al. (2020), grittier teachers who stay in the profession have a growth attitude, which makes them more resilient to setbacks and disappointments. The tendency to expend substantial efforts into their work is also clearly shown by the higher number of thought units related to Progress Check. It appears that these teachers spare no efforts in ensuring that their students are actively involved in the lessons and are continuously on task. They also appear to put more efforts into ensuring that the instruction is enacted smoothly from the start to the very end, as shown by the higher number of thought units related to Procedure Check. Furthermore, they are more concerned about plateaus in the course of teaching and students' learning problems by addressing the students' problems which is related to Problem Check category.

On the other hand, it appears that LG teachers seek to balance the syllabus with their teaching, and mainly focus on time management, as revealed by their higher number of thought units related to Time Check. They constantly look at their watches to check out the time. They appear to worry about time management. On the other hand, HG teachers balance the time more effectively and avoid wasting it; they manage their time in a way that enables them to focus on their teaching, syllabus, subjects, and students. They adhere to a pattern allowing them to have a plan, and manage their time more precisely. HG teachers seem to care about time management but they were rarely concerned for it.

CONCLUSION

Teachers' thought units during instruction have attracted ample research attention (Mullock, 2006; Gatbonton, 2008; Akbari and Dadvand, 2011, 2014; Karimi, 2011; Karimi and Norouzi, 2017). However, variations across individual difference variables have been almost absent on the agenda of this line of research. In the light of this dearth of investigative attention, this study examined the likelihoods of differences in the PKB of teachers with varying levels of grit. The results, as pointed out earlier, revealed that HG teachers produced more PTUs compared with their LG counterparts. HG teachers also produced a wider range of PTUs as revealed by their list of dominant thought categories.

Previous research has presented calls to consider elements of teachers' PKB in teacher recruitment and admission policies (Akbari and Dadvand, 2014). Given the significance of grit as a personal trait in L2 teachers' PKB, as revealed by the findings of the present study, it is advisable that organizations and institutions include grit as one of the important components of teacher recruitment policies and paradigms. Organizations and institutions can use the L2 teacher grit scale as an effective and succinct measure of L2-teacher grit. The L2-Teacher Grit Scale has been found to be a reliable and valid self-report measure. This Scale may aid in recruiting and selecting dedicated teachers who are committed to their student's success and attainment (Sudina et al., 2020). It is further suggested that teacher training

programs include initiatives to enhance teacher grit on their agenda through identifying factors that enhance individuals' grit (Christopoulou et al., 2018).

LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

For a number of reasons, it is necessary to exercise caution when interpreting the results of this study. First, although authors pursued Gass and Mackey's (2000) recommendations to enhance the reliability of stimulated recall technique, the inherent subjectivity associated with this technique (Clark and Peterson, 1986), coupled with the difficulty in uncovering the unobservable thoughts underlying teaching (Mullock, 2006, p. 52) might have influenced identifying, segmenting, coding, and categorizing the thought units. Future research should consider supplementing stimulated recalls with other techniques to remove the associated shortcomings and provide a more objective and comprehensive way of investigating teachers' pedagogical thoughts. Second, only eight teachers were chosen as participants due to feasibility considerations. Earlier studies also recruited eight or fewer participants. Therefore, prospective investigations should consider recruiting larger groups of teachers as participants. Third, only one instructional session per teacher was video-recorded. Future studies should video-record a higher number of instructional sessions per teacher. Finally, as one of the reviewers of the present study stated it is not enough to categorize the two groups of participant teachers only based on a grit scale and ignore other important variables. Future research may employ supplementary measures to categorize participant teachers.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Imam Khomeini International University, English Language Department. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MS, PA, and MK contributed to the design and implementation of the research, analysis of the results, and writing of the manuscript. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.890834/full#supplementary-material

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