

## Complex dynamic systems of language teacher cognitions: A case study from Bangladesh

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Teacher cognition research has provided useful insights into complex, dynamic, and contextual teaching processes. Yet, there is no systematic framework for describing the complex, dynamic and contextual features of teacher cognition. This research applied complexity theory to the analysis of characteristics of teacher cognition systems of an English as a foreign language (EFL) teacher in Bangladesh and examined how the relationship between the different components of teacher cognition systems led to the complex characteristics of their cognition and teaching practices. The case was investigated using multiple sources of data collection which included in-depth interviews, classroom observations and stimulated recall. The findings present evidence of the EFL teacher's complex knowledge of communicative language teaching and curriculum implementation through classroom practices, the influence of his prior language learning experiences on his practices, his experiences as a novice teacher resulting from teacher training input, his classroom interactions with his students, and further professional development.

### Language teacher cognition

The history of language teaching cognition research dates back to the 1970s, but more attention has been paid to this line of study in recent years by educational researchers seeking to respond to what teachers think, believe, know and practice (Borg, 2015). This is mainly because what teachers believe, know, and think (Borg, 2003) has a direct impact on their decision-making and practices in the classroom (Basturkmen, 2012). In the last 20 years, although no significant theory has evolved in teacher cognition, there has been considerable evidence that the characteristics of teacher cognition are complex and heterogeneous, dynamic, and contextual and co-adaptive.

### Complex and heterogeneous

Teacher cognition is an unobservable cognitive dimension of teaching (Borg, 2003) and an overarching term that refers to any of its constructs (e.g. beliefs, attitudes, knowledge) with respect to any aspect of language teaching (Borg, 2015). They include but are not limited to pedagogical content, language teaching practices, prior language learning experiences, and language learning processes (Feryok, 2010). The relationship between the teaching cognition components of language teaching is complex. Teacher cognition is influenced by prior language learning experience of teachers, which Lortie (1975) described as *apprenticeship of observation*. It provides an initial understanding to teachers of what language teaching is, and how it should be taught (Cancino, Durán, & Solorza, 2020; Moodie, 2016; Rahman, Singh & Fersi, 2020), based on which teachers further decide

what best practice for teaching is. However, the nature of explicit or implicit evidence of teacher cognition demonstrates the system as heterogeneous, multi-factorial and multi-dimensional, and the components of teacher cognition may not have the same degree of interference and influence (Zhang, 2015).

### **Dynamic**

Teacher cognition evolves over time through new experiences, new inputs, and the realities of the classroom emerging from the interaction. Teacher cognition and classroom practices are found to be shaped differently between experienced and novice teachers (Junqueira & Kim, 2013). In addition, Borg's (2011) study demonstrated how a teacher education program can have an impact on the cognition and classroom practices of language teachers. Tudor's (2003) study also defined the non-linear existence of pedagogical reality in teacher cognition that emerges dynamically from interactions between (classroom) participants. In a more recent study conducted in China (Huang, Teo & Zhou, 2019), EFL teachers' age and experience were found to be the key factors influencing their technology acceptance in the classroom. The study postulated that teachers' cognition is shaped over the years after commencing teaching. Similarly, previous studies such as Rahman, Pandian & Kaur (2018) and Karim, Reshmin, Kabilan, Shahed, Rahman & Singh (2020) in Bangladesh, Kamiya (2016) in the USA, Mason and Payant (2018) in Ukraine also pointed out several gaps between teachers' cognition and their classroom practices, advocating the fact that their cognition emerged dynamically and in a non-linear manner through the process of teacher learning. This dynamic nature of language teachers' cognition from their primary condition to the current state is based on experience, new input and classroom reality emerging from interactions, which is the reason why "inferred cognitions based on practices often appear at odds with stated cognitions" (Feryok, 2010, p. 273).

### **Contextual and co-adaptive**

Contextual factors consciously or unconsciously impact cognition. Such factors mediate between cognition and teachers' behaviours inside and outside the classroom (Borg, 2015). This is why Johnson (2015) proclaims that context shapes teachers. The complexity of teacher cognition and its dynamic development are shaped contextually. Existing studies (and frameworks) have therefore conceptualised the role of context in shaping cognition among teachers, in particular its relationship with classroom practice (Borg, 2015). Although teacher cognition and classroom practices are related, their relationship is not of a definitive nature, at least to the extent they interact or interfere. As a result, the knowledge and practices of teachers in the classroom are found to vary from consistent to inconsistent (see Basturkmen, 2012 for review). Curriculum and institutional policy (Zhang & Liu, 2014), teaching and learning culture of the context (Amerian & Pouromid, 2018), classroom environment (Rahman, Islam et al., 2019) play an important role in shaping the way teachers understand and what (and what not) they practice in the classroom. Kumaravadivelu (2003) rightly pointed out that different contexts require language teachers to re-interpret principles in locally relevant ways.

Given the above-mentioned characteristics of teacher cognition reported in existing studies, there is a need to see them as part of a complex system in which teacher cognition, classroom practices and contexts can be combined as complex, dynamic, and contextual interactive components. Thus, in this study, complexity theory has been incorporated to explain cognition of language teachers, not in a fragmented way, but as a complete system, considering the fact that teachers' cognition may be expressed or may be implicit, and may be the core in influencing teachers' practice or may be peripheral. Such complexity of teachers' cognition will lead to its dynamic interaction with practice.

### **Complexity theory in teacher cognition**

The complex system theory or complexity theory linked to chaos theory, or also referred to as the dynamic system theory, offers a theoretical basis for the interpretation of teacher cognitions. After its systematic introduction in applied linguistics in the late 1990s by Diane Larsen Freeman, complex system theory has been widely used in fields of research such as L2 production and development, bilingualism, and multilingualism (Larsen-Freeman & Cameron, 2008). Complex system theory is one of the few theories suggested for the study of teacher cognition research that would describe the multi-layer existence of the teacher cognition system (Feryok, 2010). The term "complexity" has a different meaning in this theory than in common language. Although complex systems are filled with turmoil, unpredictability, and confusion, they possess the capacity of change (Zhang, 2015). The word "system" here refers to a set of elements so related as to form a unity or organic whole (Zhang, 2013, p. 332).

The core facets of complex system theory associated with the current study have been illustrated in applied linguistic literature and teacher development, as complex (and heterogeneous), dynamic and contextualised (Larsen-Freeman & Cameron, 2008; de Bot, 2008):

- Complex or heterogeneous system indicates the manner in which different types of agents or components interact with each other (Larsen-Freeman & Cameron, 2008). According to Larsen-Freeman and Cameron (2008), the way in which the "interaction of parts of a complex system" opens up prospects for the collective behaviour of the system will influence the way in which the "system interacts simultaneously with its environment" (p. 1).
- These interactions of the complex systems are dynamic in nature, which has the capacity to change over time (de Bot, 2008). Particularly, as explained by de Bot (2008) and Larsen-Freeman and Cameron (2008; cited in Feryok, 2010), these dynamic interactions are "sensitive to initial conditions, with small changes in an initial state creating large unpredictable differences in later states, meaning change is non-linear" (p. 273).
- Complex systems are also contextualised and co-adaptive (Zhang, 2015). Complex dynamic systems are related to other internal and external systems and work as an ecosystem (Feryok, 2010). They are co-adaptive and open; they respond to and are

responded by other systems, and also influence and are influenced by other systems (Larsen-Freeman & Cameron, 2008).

As only a handful of studies have examined the nature of the relationship between teacher cognition systems, this thesis adopts complex system theory as the theoretical and methodological framework to explain the complex, dynamic and contextual nature of teacher cognition. By drawing on a case study of an English as a foreign language (EFL) teacher from Bangladesh, this study applied complex system theory to reclaiming its relevance in language teacher cognition, as previously demonstrated in Feryok's (2010) retrospective study conducted in an Armenian context. For further generalisation of the findings by Feryok (2010), case studies from other contexts are required, such as the Bangladeshi context for our study.

### **Situating the case study**

As stated above, this study reports on the case of an EFL teacher in Bangladesh. In Bangladesh, curriculum reform took place in the late 1990s, when grammar translation method (GTM) was replaced by communicative language teaching (CLT) approaches (Hamid, 2010; Rahman & Pandian, 2018; Rahman, Johan et al, 2019). The change from a conventional, teacher-based teaching approach (e.g. GTM) to a more student-centred, experience-based, problem-solving teaching approach (e.g. CLT) is a complex and dynamic process for language teachers. More technology-oriented teaching approaches have been incorporated in recent years, for instance, the use of audio-visual devices (Karim et al., 2017). However, changes in curricula do not necessarily contribute to adjustments in teacher cognitions and behaviours. Although several teacher training programs have been incorporated (see Karim et al., 2019), Karim et al. (2018) questioned the impact of these teacher development facilities in the context of Bangladesh, given the fact that these are mostly donor funded projects to build English language teaching infrastructure in Bangladesh (see the recent study of Hamid & Jahan, 2020). Partly due to this, it is also important to understand the dynamic attributes of language teacher cognition in the context of Bangladesh, especially how and why teacher cognition has been shaped in the current manner from how they were in the initial set-up. In addition, teacher cognition is based on the context, which means that the behaviour of teachers towards curriculum reform must be understood in the context of change, whether or not they have co-adapted the change. Previous studies in Bangladesh have repeatedly explained that teachers are a barrier to the implementation of different aspects of the CLT curriculum such as assessment (Ali & Hamid, 2020; Sultana, 2019), methodology, and instructional materials (Nuby et al., 2019; Rahman, Singh & Pandian, 2018).

However, there has been little focus on investigating teacher cognition and classroom practices to explain how teachers view changes in their lives and the factors that influence their practice in the classroom context (see Karim et al., 2020; Rahman et al, 2019a; Rahman et al., 2020 as the exception). In addition, studying cognition of language teachers and teaching practices related to curriculum change as components of a complex and dynamic system has not been studied previously. Thus, conceptualising broader and deeper understanding of complex system of teacher cognition by analysing in the context

of Bangladesh, this study aims to explore in-depth understanding of the following research questions:

- a. What characterises the complex and heterogeneous cognition systems of a Bangladeshi EFL teacher and how did it influence the implementation of curriculum reform in the classroom?
- b. How dynamically did the teaching cognition and curriculum reform implementation in the classroom interact and emerge?
- c. How did the complex systems of teacher cognition and co-adaptation influence the implementation of the curriculum reform process?

The case discussed in this study is part of a larger study for which data were collected from 2017 to 2019 over a period of three academic years. Mohammad (pseudonym) is one of the senior English teachers in a high performing secondary school in Dhaka, Bangladesh. He has a BA in English, an MA in English and a BEd degree, with 22 years of teaching experience. His experience as a learner and novice teacher was based on the previous GTM curriculum, though he soon started teaching with the CLT curriculum (Figure 1). During his career, he attended teacher training programs introducing him to the CLT approach to language teaching and new aspects of CLT-based curricula, such as the new goal and objectives of the curriculum, the new textbook and assessment system. Selection of Mohammad as the case for this study was based on a purposive sampling method (Yin, 2018). For the study, an experienced teacher was needed to explain his/her complex cognition since it was shaped through several curricula. As an experienced teacher, 5 years with GTM and 17 years with CLT, Mohammad could reflect on the dynamic interaction between his language teaching cognition and classroom practice, and also visualise how it evolved over years. It was important to understand the role of teaching-learning culture and approach in the shaping of Mohammad's cognition and how it has been co-adapted to Bangladesh's language curricular and English language teaching context.

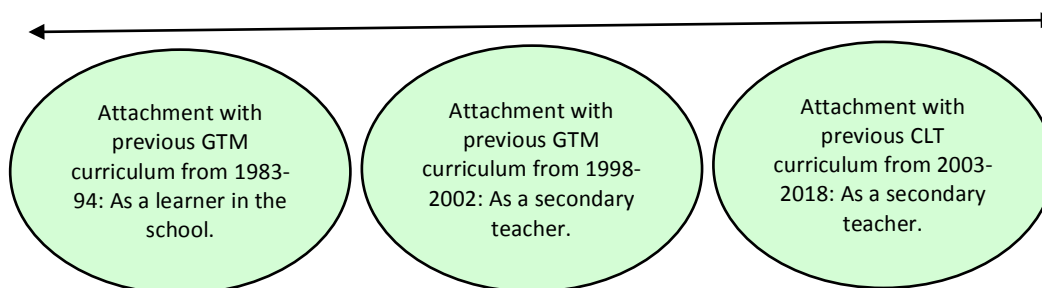


Figure 1: Mohammad's curriculum reform experience over two decades

Multiple data sources (two in-depth interviews, two classroom observations and a stimulated recall interview) were collected for analysing the case (Yin, 2018). Together with a rich description of the case and the context, multiple data sources allowed not only triangulation of data sources, but also transferability of the qualitative case study method, as opposed to the idea of generalisation in quantitative research (Yin, 2018). Data were

collected in order to explore two main aspects of the new CLT curriculum that required primary attention from teachers, namely communicative activities and the role of teachers in the classroom. Interviews were developed focusing on these issues in the classroom, which were perceived and practised differently by Mohammad as a student and teacher at the beginning of his career under the previous GTM curriculum. We asked Mohammad to provide detailed examples of how his teaching cognition related to these issues could be articulated, and he also indicated his practices in the classroom, while discussing the field notes after the lesson. Through the stimulated recalls and follow-up interviews, he had the opportunity to explain the contextual factors that might not allow (or facilitate) him to translate his cognitions into practice and how he has adapted to curricular changes over the years.

Both inductive and deductive methods (Creswell & Poth, 2017) were used in the analysis and presentation of the data. Guided by the research questions and theoretical framework discussed above as an analytical tool to highlight the 'interconnectivity' of the teacher cognition system, three broad themes were pre-determined: complexity and heterogeneity of teacher cognition (Q1); dynamic interaction between teacher cognition systems and practices (Q2); context influence and co-adaptation of teacher cognition (Q3). Keeping these themes in mind, we carefully reviewed the data and identified important codes that reflected Mohammad's cognition. This approach to data analysis in qualitative research is known as the deductive method of data analysis.

## **Results and discussion**

This section reports three main themes, answering the corresponding research question of the study, respectively.

### **Complexity and heterogeneity of Mohammad's cognition system**

In this study, teacher cognitions were examined as being composed of the following two main areas of language learning that needed to be adapted to Mohammad's language teaching cognitions: communicative activities and the role of teacher in the classroom.

Mohammad had recently been made aware of the need for a complete change in his teaching cognition to understand and act on the key aspects of the CLT-based curriculum, but these aspects were fundamentally different from the previous GTM-based curriculum. As Mohammad explained, the objectives of the curriculum were as follows:

This is a dramatic shift that I think took place at that time [...] They decided to move from a teacher-centred to a more student-centred shift in the approach to language teaching that was previously used by the GTM-based curriculum, particularly in the classroom environment. It has also transformed teaching approaches from memorisation of grammar and vocabulary to meaningful communicative tasks. (Excerpt 1)

As Mohammad pointed out, the change had taken place suddenly and surprised him. At that point of time, he had just begun his career as a language teacher at the school. He expressed his views on the communicative approach to teaching:

The CLT is an integrated approach to language instruction, combining all four language learning skills, grammar and vocabulary into an inductive process using authentic materials. The aim is to develop communicative skills in a cooperative environment. (Excerpt 2)

Mohammad was also asked to comment on the roles of teachers in the classroom, and these were different from the ones he experienced as a learner and also in the early days of his teaching. According to Mohammad, "Today the role of teacher is more like a facilitator" (Excerpt 3). As he explained further:

Much has improved in ELT Bangladesh over the last 30 years. While my teachers used to be the focus of the classroom attraction, now we have a different role as a teacher, and it's to make our students communicate by teaching them the structure of the language. (Excerpt 4)

It is evident from interviews with Mohammad that he has cognition of different aspects of teaching and learning English, such as changing language teaching and learning approaches in the new curriculum, learning and teaching experience, and a shift in the role of teacher. However, Feryok (2010) pointed out that mere cognition of certain related topics of teaching and learning cannot be counted as heterogeneity. Teachers might even possess a number of insights into a single subject of teaching, but a degree of conviction is needed to translate cognition into practice. For example, Mohammad stated that "I cannot carry out communicative activities all the time in the classroom" (Excerpt 5), despite the fact that, as he mentioned earlier, "communicative activities are at the heart of the CLT" (Excerpt 6). He explained why he could not initiate communicative activities in the classroom, even though he supported it:

I don't have time to conduct those activities at any time. I also have to prepare [students] for the examination at the end of the day (Excerpt 7).

In order to explain this situation, it is important to understand that declarative knowledge and procedural knowledge in teacher cognition are two different components (Feryok, 2010). Communicative activities are not easily implemented, as can be seen from the interviews and observations. Mohammad believed that they are important and many of them are used in the classroom in a limited and selective manner. Similar instances could also be drawn from the context of China where the case study presented by Zhang (2013) found a complex belief regarding English teaching, which was also heterogeneous, as not all of the stated beliefs translated into practice.

### **Dynamic relationship between Mohammad's cognition systems and classroom practices**

The dynamics of the teacher cognition system contributes to non-linearity or "change that is not proportional to input" (Larsen-Freeman & Cameron, 2008, p. 31). The dynamics is the progress that can result from education or practice and may change the status of the system. New cognitions will add, change, and replace old cognitions (Feryok, 2010). Mohammad's cognition articulated through a number of forms over the years. In his early

days, CLT and roles it prescribed for teachers were not positively perceived. As he described, "It was the teacher who was the source of knowledge for us. And we used to learn the language through grammar and vocabulary memorisation" (Excerpt 8). He used to teach, therefore, according to his early notions. Over the years, his cognition has advanced, and now he is advocating CLT. What has particularly influenced his cognition to emerge is not specific. Curriculum requirements and teacher training may have an impact on his cognition and practice. As he said, "I have attended a number of training courses to learn more about CLT and my role as a classroom teacher" (Excerpt 9). The extent of the influence of this input is non-linear and not specific since, although Mohammad seemed to have several cognitions about the role of teacher in a CLT classroom, his classroom practice was not fully aligned.

As Mohammad said, the role of the teacher in CLT classrooms is to be a facilitator. In his practice, this was not the case and he was the driving force in the classroom, and teacher talk dominated the classroom. The following excerpt illustrates:

*Mohammad teaching from the book*

Mohammad: Open your book and go to lesson three.  
 Students: (in chorus) yes, sir.  
 Mohammed: Have you all gone through the question and exercises?  
 Students: Yes, sir. (Excerpt 10)

In this regard, Mohammad explained, "What is important is learning and needs of learners. Sometimes my language input helps the process" (Excerpt 11). This shows how the other aspect of his cognition, that is, student expectations, influenced his cognition of a particular practice.

The idea of learning observation has been documented in the seminal work of Lortie's (1975) apprenticeship of observation and Borg's (2015) concepts of schooling. The notion of schooling in Mohammad's teaching cognition framework highlights his prior learning experience of language teachers. Teachers form their initial ideas of teaching being influenced by their experiences. However, as Borg (2015) noted, this experience has been further shaped by professional course work, such as teacher training, which provides input to change the cognition and classroom practices. In the case of Mohammad, after attending training sessions over the years, some familiar cognitions and practices might have changed, but several others remained the same. In addition, teacher cognition continues to be negotiated in the classroom on the basis of student expectations and needs. Gradual development of consistent cognitions happens over an extended period of associative learning (Feryok, 2010), which is dynamic in nature (several mismatches between Mohammad's cognition and practice were due to the interaction between cognition and context), sensitive to initial condition (prior GTM-based language learning formed a number of teaching cognitions and practices), and non-linear to input (training input might have changed few cognitions and practices of CLT, however not proportionate). The same views were reported in the case study of Kamiya (2016), where the author found that the impact of teacher coursework varied and interacted dynamically. Although there were some changes in their beliefs and knowledge after attending the coursework, their practices were found to be acted in a different manner.



### **Influence of context and co-adaptation of Mohammad's language ELT cognition systems**

According to Larsen-Freeman and Cameron (2008), "Co-adaptation is the process by which the system adapts itself in response to changes in its environment" (p. 33). In this study, Mohammad expressed CLT as a useful approach to language teaching, since it incorporates communicative, meaningful language teaching activities, including all four skills (reading, writing, speaking, and listening), which are also prescribed in the curriculum. In practice, however, there are no communicative practices and he, as a teacher, dominated the class time. He was asked about the reasons behind this in the stimulated recalls and follow-up interviews. According to him, in the first place, "It is the teaching and learning culture of the land where teachers need to play an active role and students remain mostly passive" (Excerpt 12). He tried to explain that students want to be led by a teacher, so most of the time teachers need to talk. Second, he stated, "You need audiovisual to arrange listening practices. You cannot implement this CLT curriculum without an instrument. Where are those devices, then?" (Excerpt 13). He wanted to point out the contextual problem of classroom resourcing in Bangladesh. Third, the impact of exam-based approaches in the teaching and learning must also be counted:

Since you're asking why I skipped some aspects of the listening and speaking sections, I want you to know that, at the end of the day, there are exams that line up and they have to pass. In particular, no communicative activity, listening and speaking, is assessed in the examination. (Excerpt 14)

These are some documented problems in Bangladesh faced by teachers in implementing the curriculum (Rahman & Pandian 2018; Rahman et al., 2019a; 2019b). Although teaching and learning English language has been completely changed, Mohammad has endeavoured to comply with the CLT as stipulated in the curriculum and has also compromised a few of them due to the demands of the students and the need for context. In this study, we argue that limited implementation of the CLT curriculum, in some instances, is not a lack of teaching ability on the part of teachers, Mohammad in this case. It is the awareness and understanding of the context of teaching that has influenced him to shape his practice, despite what is stated in the cognition. Such circumstances have been widely reported in existing empirical studies and reviews of teacher cognition research (Basterukman, 2012; Borg, 2003; Rahman et al, 2019a; Zhang & Lou, 2018).

Here it can be seen that Mohammad's cognition has also co-adapted over the years, as highlighted in the study by Zhang (2013), and is influenced in two ways: First, through teacher training, his initial cognition, based on his previous experience, was shaped in accordance with the CLT; second, contextual factors also shaped his cognition and practice of using CLT in the classroom. Mohammad instructed his students, "You must write sentences that are grammatically correct in order to get full marks in the exam" (Excerpt 15). Accuracy may not be the primary aspect that CLT focuses on and has been trained in sessions, but this idea of teaching has been co-adapted in the process. It could therefore be argued, based on the case of Mohammad, that individual teachers and their teaching environments were interconnected and co-adapted.

## Conclusion and implications

The findings of the study articulated language teacher cognition by highlighting the departure beyond what a language teacher believes, knows and thinks (Borg, 2003; 2015), into how their cognition came into existence and interacts within a system that is complex, dynamic, contextual and co-adaptive (de Bot, 2008; Larsen-Freeman & Cameroon, 2008; Feryok, 2010; Zhang 2015). Figure 2 shows a conceptual framework of Mohammad's complex cognition system.

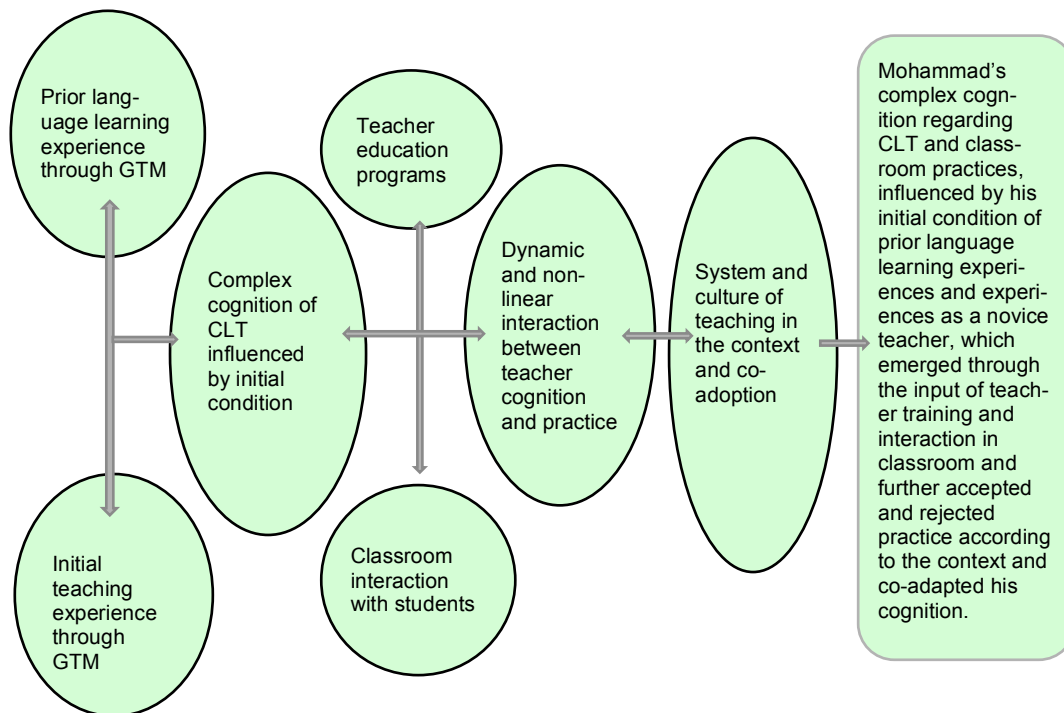


Figure 2: Conceptualisation of Mohammad's complex cognition system

It is evident from the discussion that the language teaching cognition of Mohammad evolved over a period of time and moved to different trajectories being influenced by multiple factors. The same factors influenced him while incorporating new classroom teaching and learning knowledge and skills into his practice. For example, adapting to CLT from GTM, incorporating technologies in classroom pedagogy (e.g. audio-visuals) reflect some of Mohammad's evolving teacher cognition. The knowledge base of Mohammad was strongly influenced by prior language learning which he himself experienced. Besides, contextual factors such as the lack of resources in the classroom, out-of-date expectations in the curriculum, washback effect of assessment or exam-oriented language teaching remain the other most significant influence in shaping Mohammad's cognition, which is also highlighted in the recent literature review of Islam et al. (2021) in the context of Bangladesh. Although his professional learning (e.g., teacher training) consequently changed his prior learning regarding language teaching and learning

and shaped his current knowledge base, he made an effort to adjust the practices by familiarising himself with different aspects of teaching and learning of the new curriculum. But even then, the influence of the earlier context and prior language learning was evident in his teaching knowledge and practices.

Based on the findings of the study, we argue against a widespread implementation of the CLT-based curriculum reform in non-native English-speaking countries (Nunan, 2003), more specifically in Bangladesh (Rahman et al., 2018b; 2019a). Most of the earlier studies identified teachers as the inhibiting factors for the implementation of CLT. This study explained why, despite their positive attitude towards CLT, English language teachers in EFL (also ESL) contexts often fail to adapt or implement CLT-based teaching approaches in their practices. In most contexts, the interaction between the teaching and the context has been overlooked. Therefore, while developing the knowledge base of L2 teachers through large-scale teacher development programs, the complexity of teacher cognition system that has been revealed by this study must be acknowledged. In this way, the mismatch between teaching practice and language curriculum advice could be minimised.

Language teaching involves a number of complex systems: not only language cognition but also student cognition, language itself, and education systems (Feryok, 2010). As suggested by the findings of this study, the national teaching system also plays an important role in the system of cognition of teachers. Complexity theory focuses on inter-relationships and has the potential to provide an analytical foundation that combines a wide range of fields of research relevant to language teaching, that will eventually explore the life of teachers and assist them reflect on their cognition and teaching practices.

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