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A Cognitive Model of Language Teacher Fossilization

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***Abstract*—Expertise in foreign language teaching has been widely discussed in the literature as inherently related to accumulated classroom experience and, hence, extensive practical knowledge. Even though current conceptualizations are increasingly focusing on teachers' ability to reflect on their performance and continuously develop a repertoire of didactic resources regardless of their career stage, effective human information processing in the profession remains under-researched. This paper sees the concept of expertise from the perspective of cognitive processes, and specifically operations involved in problem-solving. The author presents a theoretical model of teacher fossilization, discussing attention, knowledge, reasoning, and judgment as potential inhibitors of intellectual vitality and growth in individuals. When neglected, these factors might lead experienced teachers to make just as incompetent decisions as novice educators. The model highlights the external and internal forces that cause practitioners to minimize, rather than maximize, their learning opportunities in a workplace. The new concept has implications for teachers' day-to-day practice as well as for in-service professional development initiatives. It serves as a guiding principle for the successful utilization of one's cognitive capital and outlines both the purpose and direction of one's mental effort.**

***Index Terms*—teacher cognition, expertise, language teaching, late career, fossilization**

I. Introduction

The teaching profession, especially Teaching English as a Foreign Language (TEFL), demands that practitioners continuously improve their specialist knowledge and skills to effectively cater to a variety of **specific** needs of their **specific** learners in **specific** educational, cultural, economic, and social contexts. From the perspective of cognitive psychology, the concept of domain expertise has long been recognized as a non-linear learning process rather than the ultimate state of occupational development. It holds that an individual's mental and emotional growth occurs through confronting changes in the physical and symbolic reality (Lindsay & Norman, 2013). Information processing when addressing the unexpected (solving problems) is seen as an intentional human activity aimed at mobilizing the available cognitive resources (e.g., attention, existing knowledge structures, reasoning) to construct new meanings and formulate relevant feedback for future reference. This perspective on expertise challenges the traditional assumption that accumulated experience always reflects a person's professional competence. On the contrary, in order to make expert judgments about emerging events in the foreign language (FL) classroom, teachers need to maximize their interpretative efforts, critically evaluate what appears to be familiar patterns of incidents, and expand the limits of their current understandings.

In reality senior teachers are often perceived as accomplished performers, although studies show that didactic decisions resulting from excessive confidence or "autopilot" responses to environmental stimuli can be far from informed, flexible, and context-sensitive. There are several factors, both external and internal, that contribute to teachers gradually developing a "fossil shell" instead of deepening their domain expertise throughout their careers. This paper explores the primary cognitive causes behind language teachers becoming so-called experienced non-experts. It proposes to refer to this process as a Cognitive Model of Language Teacher Fossilization and discusses its validity in academic research as well as in teacher training programs.

The literature review below presents and challenges the predominant views on professional development in teaching. It emphasizes the necessity for empirical research on experienced teachers' cognitions, particularly focusing on specialist knowledge and its origins.

II. Literature Review

The figurative meaning of the adjective *fossilized,* as illustrated below, is essentially negative.

- "Made firm, fixed, or rigid by the passage of time" (Merriam-Webster Dictionary)
- "old-fashioned and never changing" (Cambridge Dictionary)
- "antiquated or inflexible" (Collins Dictionary)
- "unable to change or develop" (Oxford Learner's Dictionaries)
- "unlikely to change" (Britannica Dictionary)

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Both physical and abstract entities referred to as *fossilized*, such as structures, systems, mechanisms, views, approaches, or notions, imply inefficacy and failure.

In foreign language didactics, the term *fossilization* has been associated with two main concepts 1) repeated errors that become ingrained in the learner's productive performance as permanent and difficult to eliminate features, and 2) the plateau in the development of the learner's foreign language competence (Selinker, 1972). The phenomenon is primarily characterized by **resistance to cognitive progress**, which is caused by a variety of internal and external factors. Among others, studies have shown correlations between language fossilization and learners' age, their tendency to overgeneralize, and their motivation level (Benzouaoui & Fettah, 2023; Xu, 2022; Han et al., 2021; Ellis, 2000). While some theorists doubt whether FL learners can overcome linguistic obstacles and achieve native-like proficiency in the target language, others advocate for teachers to address fossilization by employing various compensatory strategies. These strategies aim to draw students' attention to the problem in order to assist them in improvement (Al-Ibadi & Breesam, 2021; Zang, 2021; Widyaningsih, 2021). Indeed, the subject has stimulated strong academic and pedagogical interest ever since Larry Selinker's publication in *The International Review of Applied Linguistics in Language Teaching.*

By contrast, the scholarly discussion about **teachers reaching a cognitive plateau** and developing resistance to growth in different aspects of their professional performance (e.g., conceptual and procedural specialist knowledge, language skills, problem-solving capacity, interpersonal intelligence, etc.) has been rather limited. Researchers have conducted comparative studies of experienced vs. inexperienced English instructors (Torabzadeh & Tavassoli, 2021; Nazari et al., 2019; Mehrpour & Moghaddam, 2018) and extensively explored the concepts of expertise in TEFL (Yazdanmehr et al., 2016; Akbari & Yazdanmehr, 2014; Richards, 2002), teacher identity (Nazari & Karimpour, 2023; Golombek & Klager, 2015; Ahmadi, 2014; Tsui, 2007), continuous professional development (Ray, 2021; Mohammadi & Moradi, 2017; Riddell, 2015), reflective practice (Godinez Martinez, 2022; Farrell, 2017), motivation, and occupational burnout (Fathi, 2021; Pourtoussi et al., 2018; Day, 2004). However, there is no theoretical model demonstrating processes contributing to the metaphorical 'fossilization' of teachers' minds, particularly their immature ability to maximize opportunities to enhance competence by diagnosing incidents in the FL classroom and engaging in progressive problem-solving (Tsui, 2005). Such a model is necessary to foster awareness among teachers that resources commonly believed to validate their instructional competence, such as extensive practice or a solid educational background, can actually deteriorate it.

Accumulated practical knowledge remains the fundamental point of reference for teachers in critical situations. Indeed, mental representations of prior experiences provide educators with patterns or schemata of immediate thought and action, enabling them to conserve cognitive energy for critically evaluating and judging the new circumstances they find themselves in (Sternberg & Horvath, 1995). As Strasser (2010) points out, teacher learning takes place through the intentional processing of new information that leads to adjustments in existing representations. This involves 1) attention to detail, 2) activation of various sources of knowledge, 3) higher-order reasoning, and 4) principle-based feedback for effective use in analogous situations in the future (Kahneman, 2011; Rodgers, 2002; Reber, 1993). Nevertheless, available evidence indicates that experienced teachers can also exhibit characteristics of non-experts; they may struggle to reconsider their personal beliefs and theories, rely on quick-fix solutions, and demonstrate excessive confidence in their didactic choices (Tripp, 2012; Richards & Farrell, 2011; Johnson, 2005; Wysocka, 2003; Bereiter & Scardamalia, 1993). A study by Yan et al. (2023) reveals that five mid-career English teacher educators evaluated their language competence as substandard and their contribution to professional development opportunities as unsatisfactory.

The theory of professional capital in education (Hargreaves & Fullan, 2012) emphasizes that teachers' decisional effectiveness is shaped by their experience and classroom practice. This enables them to navigate complex or challenging situations and make sound judgments even in the absence of agreed-upon rules or procedures. This fundamental component of expertise should be complemented, according to the authors, with close collaboration and the transfer of knowledge within a workplace community to ensure the continuous development of individual instructors and schooling institutions. Importantly, the vision promoted as a strategy for environments requiring improvement interventions rests on the premise that teachers and their superiors are willing to engage and take full responsibility for their professional growth. Hargreaves and Fullan (2012) do not elaborate, however, on the higher-order dimension of knowledge construction and exchange.

The model proposed in this paper addresses the risk of mental stagnation that teachers face due to insufficient engagement of their cognitive resources in response to episodes that "have enormous consequences for personal change and development" (Sikes et al., 1985, p. 230).

III. A Cognitive Model of Language Teacher Fossilization

Figure 1 below presents a model that encapsulates both the cognitive resources involved in **problem-solving situations in teaching** (i.e., attention, knowledge, reasoning, and professional judgment) as well as internal/external factors that affect the administration of these resources. For descriptive purposes, the elements located on the periphery of the diagram will henceforth be referred to as "calcifiers" because, ultimately, they are believed to inhibit rather than stimulate human information processing at critical junctures.

Problem-solving is the focal point of the model because, as argued by Feltovich et al. (2006), unexpected and puzzling occurrences are likely to motivate individuals to develop new causal relationships between situational components. Teachers' reactions to difficulties reveal their domain competence, level of open-mindedness, and cognitive flexibility, all of which indicate a stage in their professional development. In the foreign language classroom, a variety of potential challenges extend beyond the complexity of the subject matter or class management. Both the intercultural dimension of teaching English as a foreign or second language and a wide range of specific learning needs constitute challenging terrain to navigate.

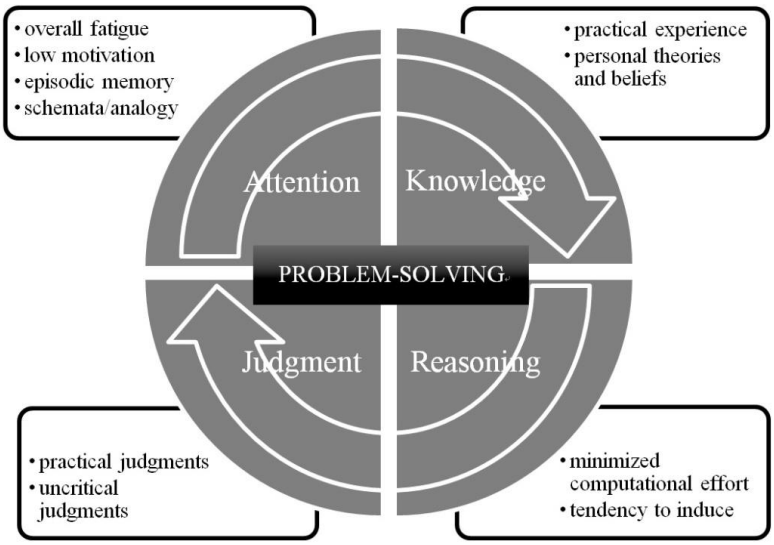

Figure 1. A Cognitive Model of Language Teacher Fossilization

A. Attention

As Hayes (1989) put it, problems can only be solved when a gap between the current state and the desired state is recognized and accurately depicted/represented. Indeed, the fundamental step in selecting an adequate course of didactic action is **observing** that there is an issue to attend to. Teachers construct mental representations of complex issues in unique ways, utilizing their sensory, imagery, intellectual, and emotional capacities. This fact questions, to some extent, the concept of experienced practitioners with their distinct pattern-recognition skills being superior to novices. Specifically, individuals who are new to the profession are highly responsive to stimuli. Their focus and computational effort increase and sharpen even when they feel anxious, overwhelmed, and uncertain about what they observe. Styles (2006) maintains that motivation to build meaningful connections between one's existing knowledge and the external world is a good enough objective to successfully manage attentional processes and bring into focus what might broaden personal and professional understandings.

By the same token, extensive practice, or, in cognitive terms, a reservoir of mental models of classroom situations, allows mid and late-career teachers to promptly respond to the environment in tried and tested ways. However, familiar schemata are activated at the expense of attention to nuances and subtleties (Berliner, 1994). In other words, experienced teachers, equipped with their abundant episodic memories, seek analogical coherence and thus can possibly overlook tiny yet significant incompatibilities between *now* and *then* (Holyoak, 2005). When incoming information is neglected or roughly represented, teachers fail to adopt optimal solutions to problems. Consequently, they struggle to support language learning, expand their professional horizons, and demonstrate competence.

Last but not least, overall fatigue resulting from work and age-related burdens can significantly contribute to teachers' inattention or incorrect recognition of patterns in the classroom environment. Senior educators who strain to thoroughly observe lesson contents, interactions, planned procedures, and behaviors may be unable to recognize the need for revision and innovative approaches. Low levels of motivation, which are not uncommon among experienced practitioners, do not support attentional processes. The complexity of foreign language instruction can discourage many individuals from engaging in the cognitive work, especially when they perceive their efforts as unacknowledged and face intolerable systemic or institutional pressures. This might also result in automatic responses to emerging difficulties.

On the whole, the powers of observation do not improve along the professional path unless teachers choose to make effort to enhance them. The continuous mobilization of attentional resources is certainly the primary preventive measure for professional fossilization.

B. Knowledge

Alexander et al. (2011) point out that events in teaching offer the best orientation toward knowing as they prompt questions about what occurs. These questions, in turn, necessitate the activation of specialist knowledge and an

evaluation of its application. The longer teachers work, the easier it becomes for them to answer questions about perplexing situations. This is because they have acquired a proper understanding of the scope of the curriculum, the institutional settings, and the general educational context with its cultural, economic, and political undertones. They are also familiar with their learners' profiles and needs, didactic materials, lesson procedures, instructional and management techniques, not to mention the subject matter, their well-established professional identity, and psychological make-up. However, there are areas of expertise in TEFL that are increasingly threatened among experienced practitioners.

The model of teacher fossilization indicates two major calcifiers: teachers' personal theories and their practical knowledge, both of which are highly resistant to cognitive renewal. First, it is worth stressing that what teachers know and think about FL instruction has been shaped by various factors, such as their individual life paths, including their own language learning experiences, preferred teaching styles, pre-service education, critical incidents in their work, significant others, and institutional demands (Borg, 2006). Over the years, their impact amplifies teachers' conceptualizations of what works and what does not work in the classroom. For example, the selection of grammar teaching strategies, lesson interaction patterns, testing methods, or feedback tools, to name just a few, reflects teachers' subjective, and sometimes biased, interpretations of the language learning process. In the era of increased human mobility and intercultural communication, instant and digitalized access to information, AI assistance, developments in neuroscience, and new trends in teaching English resulting from these phenomena, open-mindedness and adaptability become principal teacher qualities. In short, the validity of long-established assumptions and beliefs may become doubtful in the fast-changing reality and educational challenges it generates.

Secondly, the practical dimension of work, namely procedures applied by instructors to create optimal conditions for learning, constitutes a legitimate source of teacher knowledge provided that the didactic decisions have rational and specialist justification (Maclellan, 2015). Unexamined routines build up teachers' tacit knowledge and instinctive responses to problems, rather than informed ones. Tripp (2012) interestingly observes that teachers who cannot explain what they do and why are akin to doctors who administer treatments based on what they 'feel' or 'hope' will be effective. Experienced educators bear a special responsibility towards society, similar to doctors or lawyers, but they also face the highest risk of becoming disconnected from advancements in educational research. TEFL literature offers much more than just pools of classroom activity resources to choose from; it abundantly helps practitioners align theory with action. Teachers who neglect it expose themselves to professional fossilization.

Overall, personal theories and repertoires of workable solutions/behavior patterns do not encourage teachers to explore their field, test hypotheses, boost reflective thought, and expand knowledge boundaries. By contrast, they may substantially impede teachers' problem-solving performance.

C. Reasoning

Reasoning involves establishing relationships between pieces of internal and external knowledge activated as a body of evidence to examine in a problem-solving situation (Strasser, 2010). The principal aim is to successfully integrate distributed mental representations. As a result of operations performed on available representations, new configurations of information are formed, laying the foundation for conclusions. A degree of computational effort and adopted lines of reasoning can either lead to a desirable outcome or have a calcifying effect.

When teachers confine their thinking to familiar paths, they overlook potentially relevant sources of professional guidance that they could have explored but did not see as valuable connections to make. For example, the fact that students failed to do homework may initiate a common yet highly simplified train of thought, starting from the premise that a task given to students is their statutory obligation to the claim that failing in duties indicates an irreverent attitude deserving a reprimand. Challenging questions about the validity, format, clarity, or familiarity of the homework, as well as about the teacher's own beliefs in this regard, can lead to advancing a new explanation of both the phenomenon and its causes. Similarly, collective feedback provided to English learners on their writing should go far beyond what are referred to as common mistakes. It is rather naive to think of this technique as a beneficial corrective to language production inaccuracies, but it remains a widespread practice among teachers, including seasoned ones. Addressing the problem so selectively indicates that instructors do not incorporate the theoretical principles of second language acquisition, differentiation, or learner psychology in this instance. Tsui (2005) discusses the concept of 'problematizing the unproblematic,' which can be a helpful strategy for teachers as it enables a more thorough benchmark for the future. However, research indicates that experienced teachers often prioritize mental short-cuts over analytical thinking processes, even when the former are based on limited or selective evidence.

Furthermore, inductive inferences prevail in workplace contexts as they are immediate and natural responses to rising issues. They can be perfectly logical, but their accuracy, especially when based on limited observations, calls them into doubt as a basis for effective problem-solving, not to mention professional expertise. Those who primarily rely on inductive reasoning expand their practical knowledge. However, without challenging assumptions and testing them against domain paradigms or theories, they may generate instinctive short-term answers rather than optimal ones. Indeed, inept inductive reasoning sets a cognitive trap for teacher thinking, and it can lead to cognitive fossilization.

In summary, higher-order reasoning operations play a crucial role in problem-solving. This is why their potency regulates the extent to which learners benefit from the proposed solutions and also demonstrates the cognitive capacity of the teachers. In the field of Teaching English as a Foreign Language, this aspect of intellectual performance is as important as in other educational subject areas.

D. Judgment

Professional judgments on instruction-related matters, including problematic situations, are teachers' best estimates of the occurrences based on their observations, specialist knowledge, and logical reasoning. Tripp (2012) proposes a typology of judgments that comprises practical, diagnostic, reflective, and critical conclusions, with critical judgments requiring the most of cognitive effort. This is because teachers not only act upon their analysis of potential causes of disturbances and awareness of competent ways to repair damage but also engage in a prolonged process of verifying both personal and professional standards that guide their didactic moves. To confront values and principles, it is necessary to demonstrate intellectual and emotional maturity and rigor, qualities that are expected to be found in experienced educators. However, as Wysocka (2003) points out, senior teachers tend to be confident in their convictions and lack self-awareness. In her study, ELT instructors claimed that they promoted the communicative approach in their classrooms, even though lesson observations failed to prove this. Their self-critique may have been hindered by uncritical thinking and judgment.

The other complicating factor in making effective judgments is an excessively exaggerated focus on the practical aspect of the English teaching profession. In-service Continuous Professional Development (CPD) sessions are common in educational settings, along with numerous online initiatives, most of which aim to provide practitioners with exciting and applicable ideas. Regardless of how inspirational they can be, resources in use need solid conceptual foundations, which can only be established through careful consideration. Foreign language didactics is an academic discipline and as such should not be limited to fun-oriented creative activities as a response to learners' needs. For example, if the teacher avoids pair work and justifies it by students' reluctance to interact within such patterns, it might as well be his or her reluctance to admit that he or she struggles to arrange these patterns effectively or finds eliciting the outcomes time-consuming. When contemplated in a truthful and responsible manner, the teacher may discover possible underlying biases and opportunities for adjustment.

Overall, the concept of professional fossilization offers a fresh perspective on the stages of teacher development. It complements our current understanding of expertise by introducing an inherent risk of cognitive stagnation. It also indicates the enemy forces that teachers can successfully combat if they aim to demonstrate high competence throughout their careers.

IV. Discussion

The model presented above may understandably prompt questions about its universality, central focus, or other factors influencing fossilization processes in teachers. First and foremost, cognitive stagnation is not limited to foreign language instructors, so the model is expected to be considered relevant across the educational board. After all, many years of classroom practice may lead teachers to operate on "autopilot," regardless of their subject specialization. However, teaching foreign languages, especially English, cannot be entirely effective if educators do not adapt didactically and linguistically to the changes in the modern world. Li (2014) observes that one reason why Content and Language Integrated Learning (CLIL) is now of particular interest to Applied Linguistics is that teachers must now be "Jacks of all trades" and draw on knowledge from various sources, including systematic developments in English vocabulary in science and emerging professions. Bandura (2007) emphasizes the new role of English teachers as intercultural mediators in increasingly ethnically diverse classes, where communication competence is as important as language instruction. When considering the revolutionary concept of World Englishes or proposals by advocates of Lingua Franca Code (LFC) and Native English as a Lingua Franca (NELF) to simplify language properties and modify pedagogical approaches accordingly, teachers must be alert and intellectually active to confront their cognitions formed a decade or two earlier. Reality proves the opposite, though. Educators often lack interest in research; they tend to avoid reading domain-related articles and books, opting instead for professional development workshops that promise quick-fix solutions (Willingham & Daniel, 2021). Therefore, the peculiarities of the TEFL landscape in today's world make the model particularly applicable to English teachers as its specific audience/recipients.

Secondly, the model supports Dakowska's (2015) conceptualization of teaching as a form of strategic behavior that involves diagnosing problems in the classroom and designing appropriate solutions. A lesson plan, for example, is the outcome of choosing one option from many available options that the teacher deems optimal for the specific class conditions. Given the varying class conditions, instructors should consider all aspects of the teaching and learning environment as a combination of intricate cognitive tasks that necessitate adaptable responses. Generated episodically, these responses evolve from temporary to lasting knowledge representations. Effective problem solvers always allow room for potential adjustments or replacements based on collected feedback. In other words, problem-solving is an instance of making mental calculations, an integral part of which is recognizing and processing what is known and what is unknown. In this sense, questions such as *When should I incorporate pronunciation practice? How do I arrange it? What should I stress in the reading activity?* or *What is the objective of my class?* are all problems teachers face on a daily basis. They become either constructive or detrimental moments in teachers' cognitive growth, depending on how educators utilize their mental resources. This paper aligns with the view that automatic transfer of past experiences hinders the consideration of novel information and the search for novel solutions.

Finally, the model does not consider perception as a potential calcifier in cognitive function. This is because intelligent human beings naturally engage in four-dimensional coding of environmental stimuli (Sieb, 2017). As long as

we are conscious, the neural structures of the brain expand by converting and systematizing incoming information as representations of the external world. Regardless of age and educational status, individuals experience the physical and non-physical aspects of reality idiosyncratically. However, we all construct visual and affective representations, along with cognitive ones, as survival-oriented reactions to stimuli. The way we construct meaning from these representations marks the moment of goal-oriented cognitive functioning, and therefore controlled thought processes. This is exactly where the process of potential fossilization begins.

This paper aims to stimulate academic interest in the topic of teacher cognitive fossilization and encourage research into the processes discussed above. Expanding our understanding of how experienced educators react to problems in the classroom is indispensable for renewing the long-established concept of expertise in teaching.

V. Conclusion

There are occurrences in teaching that are much more complex than they seem on the surface. They must be dissected in order to identify the core of the problem and its causes. Experts pay attention to discriminatory cues in their search for relevant solutions. They actively retrieve and combine various types of specialist knowledge at their disposal. Additionally, they formulate qualitative evaluations of the problem situations, which will continuously contribute to re-organizing their professional understandings. Such goal-oriented strategic behavior is exactly the opposite of the mental operations that experienced non-experts engage in. Their minds, which tend to simplify multifaceted matters and rely on constant repetition of thought/action patterns, challenge cognitive fitness. The cognitive model of language teacher fossilization highlights the significant risk associated with passively utilizing resources such as attention, knowledge, higher-order thinking, and judgment. The risk essentially involves applying partial, superficial, or false methods to address problems in the classroom.

The model should be perceived as an integral component of professional development programs because it aims to increase in-service teachers' awareness of occupational hazards. After all, if the profession is to survive rapid changes in society, educators cannot afford to lose their accountability and corrode public respect.

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