



## **EFL Teachers' Perceptions of the Concept of Working Memory and its Trainability**

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### **Introduction**

In order to better understand the nature of learning disabilities, in general, and language learning problems, in particular, a number of attempts have been made to investigate the underlying cognitive processes implicated in the learning process. One such cognitive process, with a key role in children's academic performance at school with corollaries that go well into adulthood, is working memory (WM), a set of mental processes engaged in the temporary storage and manipulation of information while performing complex cognitive tasks (Baddeley & Hitch, 1974). According to Juffs and Harrington (2001), WM 'is perhaps best thought of as a bottle-neck through which information has to pass in order to be permanently stored in long-term memory' (p. 139).

Given the importance of WM in school learning and academic attainment, first and second language researchers have also attempted to investigate the role of WM and its components in language acquisition. Mostly drawing on the Baddeley and Hitch model (1974), research indicates that the phonological and executive components are important contributors to learning and using language. Juffs and Harrington (2001) suggest that the phonological component plays a key role in L1 development through 'the processing and temporary retention of both familiar and novel phonological information' (p. 139). Regarding L2 development, it has been demonstrated that the phonological component could affect the learning of L2 grammar and oral performance. In L2 vocabulary learning, WM has been argued to facilitate the acquisition of new sound patterns. It has also been shown that the executive component plays a crucial role in the control of attention required to maintain focus and inhibit non-relevant information in both L1 and L2 development (Gass & Lee, 2011; Juffs & Harrington, 2011).

Based on qualitative data obtained from semi-structured interviews with three elementary-level EFL teachers, the current study attempted to provide answers to the following questions:

1. How familiar are EFL teachers with the concept of WM?
2. What are EFL teachers' views about the trainability of WM?

## Working Memory

Baddeley and Hitch (1974) introduced the most influential model of WM which comprised three components: (i) a phonological component as a place for the temporary storage and manipulation of phonological and verbal information, (ii) a visuo-spatial sketchpad responsible for visual and spatial information, and (iii) an executive component playing different functions such as coordinating short-term storage domains, focusing and switching attention, and activating representations within long-term memory. Later, a fourth element, episodic buffer, was added by Baddeley (2000) as a location where various types of information are temporarily stored and integrated. The three short-term storage domains, that is, phonological loop, visuo-spatial sketchpad, and episodic buffer, referred to as slave systems, contribute to the storage of information, whereas the central executive controls the function of these systems.

There is general consensus among WM researchers on the idea that the normal development of WM could encounter problems known as WM deficits in low-WM people, with the underlying cause argued to be the dysfunction of the executive component (Archibald, Joanisse, & Shepherd, 2009). A related problem facing our schools today is the difficulty in identifying students with WM impairments. To address this concern, Alloway, Gathercole, and Kirkwood (2008) presented the WM rating scale (WMRS) consisting of 20 behavioural characteristics. The scale describes children with WM failures from the point of view of teachers as ‘making poor academic progress, having short attention spans and high levels of distractibility, failing to adequately monitor the quality of their work, showing a lack of creativity in solving complex problems, etc’.

However, a bone of contention among WM researchers concerns the idea whether WM is a trainable construct (Klingberg, 2010) or a fixed trait like other individual difference characteristics such as motivation, intelligence, and so on. (Dörnyei & Skehan, 2003). To date, a number of researchers (e.g., Klingberg, 2010) have attempted to explore the hypothesis whether intervention or training programs can improve WM capacity, with mainly positive preliminary results. The results suggest that WM as a key part of general cognition can be improved in people with poor WM by broad cognitive change resulting from using some specific computer-based WM tasks (Klingberg, 2010). Also, Dunning and Holmes (2014) maintained that training can possibly encourage more efficient use of the existing WM resources via the explicit or implicit instruction of some compensatory strategies such as rehearsal, imagery, semantic linkage, etc., and that it could increase WM capacity through promoting neural plasticity by enabling low WM people to store more information.

Students with poor WM show difficulties in academic achievement along with specific patterns of problematic classroom behaviour (Alloway et al., 2008). Hence, screening and supporting these kinds of students is of great importance in educational settings. Moreover, according to Richards and Lockhart (1996), teachers’ beliefs and their teaching method are closely intertwined, so teachers’ perceptions could have a huge impact on their practices. Therefore, we thought that it would be useful to examine how EFL teachers perceive the WM construct, and whether they can identify students with WM deficits, and what strategies they think would be effective for supporting these students. It seems that such an investigation could have the potential to help EFL teachers raise their awareness of the construct and its related issues (i.e., impairment and training). In other words, the positive effect of such thinking would be teachers’ better understanding of the link between the concept and the students’ learning process in general, and language learning, in particular, and an appreciation of the need to tailor their classroom-based teaching activities to better meet the needs of low WM students. Based on this background, the current study aims to investigate EFL teachers’ perceptions of the term ‘WM’ and its trainability.

## The Inquiry

The current inquiry falls into the qualitative research approach, that is, ‘data collection procedures that result primarily in open-ended, non-numerical data which is then analysed primarily by nonstatistical methods’ (Dörnyei, 2012, p. 24). As the data were collected through interviews, they cannot be generalized to all EFL teachers, but the issues might be relevant to EFL teachers elsewhere. In this type of research, the issues raised and the principles underlying them are perceived to display a flexible micro-perspective of reality (Dörnyei, 2012). It is therefore necessary that the investigation be replicated in other contexts.

The three EFL teachers were chosen based on purposeful sampling, a way of data collection in the qualitative approach which aims ‘to find individuals who can provide rich and varied insights into the phenomenon under investigation so as to maximize what we can learn’ (Dörnyei, 2012, p. 126).

## Participants and Context

In order to elicit the teachers’ views on the WM concept, WM impairment, and WM training, semi-structured interviews were conducted with three Iranian EFL teachers from three randomly-chosen language schools in Iran. They each had about 7 to 10 years of teaching experience. They were the teachers of beginner courses for young EFL learners. The three participants were female nonnative speakers (NNSs) of English, all of whom had MA degrees in teaching English as a foreign language (TEFL).

The syllabi of these courses revolved around elementary-level phrases and dialogues. The reason for the selection of teachers of young EFL learners was that a child’s WM development at a very early age could have a major impact on their academic success years later (Alloway & Alloway, 2010). Thus, it seems vital for educators to have a good knowledge of WM, be able to recognize WM failures early on, and know how to support low-WM children accordingly.

The data were collected over a time span of three months. The interview was composed of three parts, each involving a few questions. The questions were phrased in Persian. The reason for the use of Persian in the interviews was to prevent imperfect target language command from becoming a barrier. Each interview session lasted approximately one hour. The interviews were video recorded, transcribed verbatim, translated into English, and analysed. The interviewees were briefly informed of the objective of the research, and their consent was obtained. They were also ensured of the confidentiality and anonymity of their responses.

## Data Collection and Analysis: Teachers’ Reports

In what follows, the questions posed in the interviews, along with the participants’ answers, have been provided:

Question 1: What does WM mean to you?

Teacher 1: To me, it might be a kind of memory, maybe a short or long-term memory, or as its name suggests, a part of memory that is **continuously being used**, or the ability to keep newly learned material in mind and being able to use it later or **remember what has been learned**. It seems to be a psychological term relating to **the number of items that people can keep in mind for a certain period of time**. I think perhaps the term means **trying to work on new material** by linking it to the already-existing information in the mind.

Teacher 2: I do not have a good knowledge of WM. It must be something related to short-term memory **maintaining in detail information obtained from what you see, hear, or touch**. It might

mean the ability to **do some things simultaneously** or sequentially. For example, when you ask your students to close their eyes, pick up their books, and then walk as a class activity, they will be able to do so by using their WM.

Teacher 3: In my view, what children learn first enters into short-term memory, and then after sufficient practice and repetition, it goes into long-term memory. Maybe, WM is something between short and long-term memories in terms of its function. I think it is possibly **an important stage in the learning process**.

The statements underlined in the above interviews such as *maybe, as its name suggests, possibly*, and so on imply the low level of familiarity that the teachers had with the concept of WM. The parts in bold were wild guesses on the part of the teachers about the concept which happened to be related to WM. Then, the teachers were asked about WM difficulties in students with WM, and they had little awareness of what the symptoms might be. Therefore, to answer the second research question, we had to ask the teachers to describe their troublesome students in terms of academic and non-academic characteristics since previous studies (e.g., Alloway, 2006) suggest that many of the symptoms troublesome students display are related to a low WM capacity. It is also possible, of course, that some of these students may have had other problems related to a lack of motivation, rather than a WM deficit.

Question 2: To what extent are you aware of WM deficits as well as the early warning signs of WM deficits in your students?

Follow-up question: Can you describe the academic and non-academic performance of your troublesome students?

Teacher 1: I am not very much aware of the symptoms. I have had **some students who are distracted** all the time. I should **catch their attention**. They **cannot remember** the new words of the previous lesson, let alone the words related to the lessons they were taught the previous semesters. I sometimes ask them to write down the words on the board in their notebooks, but they **make mistakes during copying**. They cannot read and understand short reading passages. While they are reading aloud, I have to **correct their mistakes repeatedly**, and again they make the same mistakes over and over again.

Teacher 2: I do not have any information about WM deficits, but I gather it must be related to people lacking self-confidence, who are maybe stressed and should be **continuously reminded of** their homework; Yet, they cannot do their homework by themselves. These types of students **lack concentration**. They seem not to be able to **keep simple items in their minds, not even for a short time**. They have problems with learning new vocabularies and cannot use high-level words in their writing or speaking, even if they have already learned them. They usually use **simple vocabularies, grammatical structures or sentences** in their written and spoken productions, and make many pauses during speaking, which is likely due to the fact that it takes them **a longer time** to say what they are going to say.

Teacher 3: I have some students who are really troublesome. They seem **not to be listening** to instructions that I give during class activities. They are only physically present in the class and their **attention seems to be wandering** all the time, and I cannot understand what is going on in their minds. They **need a lot of attention**, and all the time **seek to be supported by others**. For these kinds of students, the process of learning language skills poses difficulties, and that is why they cannot **gain good scores** at the end of a semester. Something that I think is really typical of them is

**mispronouncing** letters or words. Although they are **corrected repeatedly**, they cannot produce the correct pronunciation.

The underlined phrases above indicate the lack or low level of knowledge on the part of the teachers as to what WM deficits are, which necessitated the follow-up question about the characteristics of troublesome students. The teachers could, however, allude to signs of WM impairment which have appeared in bold. It is possible that some of the students that the teachers described may have had WM impairments which have gone, and usually go, undetected in EFL classes.

Question 3: Do you think WM can be trained? How do you think this can be done?

Teacher 1: In my view, it may be possible to train WM because I have read in some papers that memory can be reinforced. For example, reading books, **exercising, sleeping**, doing puzzles, and **using acronyms, codes, and images** are thought to be memory reinforcement techniques and could possibly be used as WM training techniques as well.

Teacher 2: I guess we can improve WM. For example, by using **repetition, practice**, and some innovative methods such as **games and songs**, memory can be boosted. I think it is also possible to devise a special **memory training program** aimed at problematic children. It would be a good idea to have these children visit **psychologists** to help them with their WM. We have neither the expertise nor the time in our classes to really identify and support these kinds of students.

Teacher 3: As to the trainability of WM in students with WM problems, I am not fully aware of the strategies that could help, but I'm sure there must be ways to help students with difficulty in WM. I think **selecting appropriate class learning activities by teachers depending on the type of children's learning styles** might be really helpful. For example, students with aural, visual, or kinaesthetic learning styles are good at using sounds and music, working with visual aids, and carrying out physical activities respectively.

## Discussion

The analysis of the first transcript concerning EFL teachers' definition of WM shows that these teachers have little knowledge of the concept. The hedging devices such as the words maybe, possibly, etc. that they used in their responses seem to indicate that they have an indistinct view toward the WM concept. In fact, they relied on either guesses or prior knowledge of the earliest classification of memory, that is, short- and long-term memory (LTM), to provide their responses. According to the most well-known model of WM (Baddeley & Hitch, 2011), short-term memory (STM) is a subcomponent of WM. However, the interviews with the three Iranian EFL teachers showed that they have an indistinct view regarding the concept, as they could not make a distinction between the two concepts. Despite this, their views seem to rightly allude to a number of characteristics associated with WM. Also, the fact that they could rightly point out to features which hold true for the WM models indicates that they may have read about WM in the past, which comes as no surprise as they all had MA degrees in TEFL. Alternatively, the term WM may have made intuitive sense to them. However, given the importance of WM in a child's academic life (Alloway & Alloway, 2010), it goes without saying that EFL teachers ought to be much more familiar with the concept of WM and the models that have been put forth.

Similarly, in the content analysis of the second transcript regarding teachers' awareness of WM deficits in the students, as well as the early warning signs of WM impairments, none of the participants were aware of the impairments or their manifestations in the students' behaviour, with all three indicating that it was the first time that they heard the term WM impairment, and two of them acknowledging this

directly by making statements such as *I am not very much aware of this* or *I do not have any information about WM deficits*. So, we had to pose the question in a different way, asking them to describe the behaviour of their troublesome students in terms of academic and non-academic characteristics. It should, of course, be noted that not all the troublesome students may have had WM problems.

Having taken a closer look at their replies, we found a number of signs that are, according to the literature on the topic, prevalent symptoms of children with low-WM capacity. The teachers said that the most troublesome students could not focus on their class activities, that they would ask for frequent repetition of the instructions by the teacher, symptoms of students with low-WM that have been mentioned in some previous studies (e.g., Alloway, 2006). The teachers also said that such students have problems with new vocabulary, which possibly reflects a deficit of the phonological component of WM in learning new sound patterns, or the impairment of the executive component both in inhibiting the information that may distract learners from learning new vocabularies (Juffs & Harrington, 2011) and in the interpretation of the semantic characteristics of new words (Cheung, 1996). They also said that these students frequently miss the letters or words in a sentence when copying them from the board, possibly demonstrating a lack of attention, which in turn could be attributable to the impairment of the executive function (Juffs & Harrington, 2011). These students were also reported to have reading disabilities related to word recognition or reading comprehension, possibly indicating the specific role of the phonological component (Alloway, 2006). Another recurrent behaviour of such students was that they would forget things easily. For example, they would repeat the same incorrect response when answering a question. The current study also indicated that these students would need to be frequently reminded of each stage of a written task, which has been previously documented in the literature as a symptom of children with a low WM capacity (Alloway et al., 2008).

According to the literature on WM training (e.g., Alloway, 2006; Klingberg, 2010), the phrases in bold in the above transcripts such as *exercising*, *sleeping*, *games*, and *selecting appropriate classroom learning activities* could be a number of viable WM intervention techniques.

As previously mentioned, WM plays a central role in class learning activities both in children and in adults. For example, it has been maintained that 'a child with a poor WM capacity will struggle and often fail in such activities, disrupting and delaying learning' (Alloway, 2006, p. 134). In other words, the impairment of WM affects the students' future academic pathway. Learning gains, therefore, are heavily dependent on the provision of a place for the integration of the information from LTM with the knowledge in short-term storage (Swanson & Saez, 2003) which falls within the functions of WM. Also, as mentioned in the introduction, according to Juffs and Harrington, the learning and use of an L2 draws on a range of cognitive processes one of the most important of which is WM (Juffs & Harrington, 2011).

## Conclusion

This study undertook a brief review of the psychological concept of WM, the ability to temporarily store and process information. Through interviews with three EFL teachers, it was indicated that the teachers are not familiar with the concept of WM. It was also indicated that they do not have much information about WM impairments and the ways these problems can be identified. In addition, they generally had a positive outlook on the trainability of WM and suggested ways that they assumed could enhance the performance of WM. The solutions the teachers provided, mainly based on guesses, happened to have already been referred to in the literature as potential remedies for WM failures.

Hence, in view of the importance of WM in the process of language learning, problematizing and operationalizing this concept in EFL classroom settings seems to be necessary. Therefore, initially we need to train EFL teachers to use the WM rating scale (Alloway et al., 2008) for screening purposes. Having taken this first step, EFL teachers need to take the results of this screening process into account and tailor their class activities accordingly. To achieve this goal, we firmly believe that the first step would be to raise EFL teachers' awareness of the concept. And since there is a direct relationship between

teachers' perceptions and practices (Richards & Lockhart, 1996), their better perception would hopefully affect their performance in the classroom. It must be noted, however, that these teachers' views are by no means sufficient and ought to be complemented by other types of research.

### Acknowledgements

The authors would like to thank the participating teachers from the two branches of Dr. Alipour Language Centre and the ILI centre at Shahrekord for their consent to be included in this research.

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(Received August 14, 2020; Revised August 26, 2020; Accepted September 12, 2020)