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Exploring Memory Systems: Types, Processes, and Implications for Learning and Teaching

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Abstract Studies on memory have been around for more than a century now. Yet, there is no agreement on its definition and categorization. It seems that memory and learning are highly correlated, and teaching techniques can lead to memory enhancement as they can facilitate information storage and retention. While scholars have highlighted the importance of co-operative and research-based teaching methods for memory enhancement, as these techniques help episodic memory store information, the importance of semantic memory and the way it stores information cannot be ignored. The current article aims to review different memory systems and their functions concerning education and learning. It describes teaching techniques that facilitate memory and learning. Finally, it recommends techniques for certain instructional settings and highlights the importance of adapting one's teaching techniques to the learners' needs and desires.

Keywords: *Teaching, Episodic memory, Memory systems, Semantic memory, Working memory*

1. Introduction

Memory has been studied for over a century by scholars of different fields of study (e.g., Baddeley, 1986; Ebbinghaus, 1913), and it has been counted among the significant cognitive function that assists in learning and remembering data (Zlotnik & Vansintjan, 2019). It is believed to be one of the few constructs known by laypeople as it is commonly encountered (Dehn, 2010). Nevertheless, it cannot be denied that, as a complex construct, memory comprises several systems with different purposes and stimulates different cognitive processes (Tulving, 1985). It is important to note that the interaction of various brain systems contributes to forming what is universally recognized as memory (Emilien et al., 2004), in which information is encoded to be stored and recovered later (Panzeri et al., 2023).

Memory and learning have always been considered inseparable, as one is impossible without the other. Memory signals learning and results from storing and retaining information or learning from past experiences (Dehn, 2010). According to Squire (1987, p. 3), "Learning is the process of acquiring new information, while memory refers to the persistence of learning in a state

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that can be revealed at a later time." In other words, learning is acquiring knowledge in the first place and immediately remembering it whenever needed. Different types of long-term memory seem integral to performing well at school. Remembering concepts and facts seems to affect learning and academic success (Dehn, 2008) to a great extent, as learners need to process and store information in their long-term memory. Moreover, the information has to be retained whenever needed (Newall & Simon, 1972). For academic knowledge to be acquired, all forms of memory, including semantic and episodic memories, play a part (Dehn, 2008). Therefore, understanding memory and related systems affects education and studies in education. However, this relationship and how memory and learning affect each other seem to inspire new learning and teaching techniques in different educational settings, as education aims at learners' lifelong retention of knowledge (Cohen, 2008). It has been demonstrated that memory enhancement techniques can lead to better learning if applied in educational settings and that different teaching methods lead to enhancing different memory types. Moreover, scholars have demonstrated that if acquired information is emotionally salient, memory is enhanced, and information retention can be more efficient (Yin et al., 2023). Different factors affect memory function, including attention, emotional salience, and reviewing the encoded data (Serences, 2016). As education is concerned with long-term remembering of learned information, this can imply that using techniques that link new information to learners' emotions can enhance learning. However, one needs to investigate whether that could be plausible in all learning contexts. This article considers different types of memory and their importance in learning and teaching. Additionally, it aims to raise issues worth considering when dealing with the interaction between memory and education, as focusing on it can enhance the quality of learning and teaching. Furthermore, this can inform us of the shortcomings of focusing on different memory types and their effect in different learning settings.

2. Different Types of Memory

Memory theories have mostly centered around information-processing explanations of how memory functions (Woolfolk, 1998). Information-processing models focus on how information is received, processed, stored, and recalled later. The brain decides whether to attend to sensory data, relate it to the previous knowledge, and store it (Matlin, 1989). Diagnosing ineffective functioning of an individual's memory is not easily accomplished. Memory problems are diagnosed when an individual shows a below-average performance in a task, possibly due to different reasons. Sometimes, memory problems are due to neurological issues, and at other times, they are due to inefficient memory use. These problems can directly affect learning and might cause hindrances. Such problems are usually noticed when learners face severe challenges at school (Dehn, 2010).

Different scholars have presented different classifications of memory systems and their functions. Tulving (1985) highlighted that we have more than one type of memory and classified memory into different types. Moreover, he maintained that these memory systems are distinct but related. According to Squire (2004), these memory systems' content, structure, and functions are their identifying factors. Wilson (2009, pp. 1-2) clarifies different types of human memory systems and functions:

> We can consider memory in terms of the length of time for which memories are stored, the type of information to be remembered, the modality the information is in, the stages in the process of remembering, explicit or implicit memory, whether recall or recognition is required, (and) whether the memory is retrospective or prospective.

Therefore, different kinds of information are processed in different memory systems, each with distinct neurological processes (Tulving, 1993). Despite the differences between these distinct memory systems, performing a cognitive task requires engaging different memory systems (Dehn, 2010). Recent research highlights the dynamicity of memory functions and claims that memory is not static (Bellfy & Kwapis, 2020). This can clarify the existence of different categorizations of memory. The following section briefly describes different memory systems and their functions.

2.1. Sensory Memory

Sensory memory processes information before other memory systems and deals with the input received through visual and auditory senses (Atkinson & Shiffrin, 1968). Sensory memory is a "raw snapshot of the features in a visual scene" (Sligte et al., 2010, p. 2), and these features do not coalesce to create cohesive objects. Therefore, very little of the information the sensory memory receives is sent to short-term memory.

2.2. Short-Term Memory

Having received sensory input, individuals decide which pieces of information need to be processed and kept for future use by attending to them selectively. If one ignores input, the information is not stored, as short-term memory capacity is limited. Hence, short-term memory seems to process rehearsed information (Dehn, 2010).

Short-term memory comprises two components: phonological and visuospatial. When one receives auditory input, it is stored in short-term memory in phonological form for a brief moment. Visual input is also stored in visuospatial short-term memory (Logie, 1996). The two components of visuospatial memory, i.e., the visual and the spatial components, are responsible for processing information about shapes, colors, locations, and movements, respectively (Pickering et al., 2001). Research into short-term memory has highlighted the importance of phonological short-term memory in verbal learning, e.g., learning new words (Baddeley, 2003; Dehn, 2008). Long-term memory facilitates short-term memory so that information can be retained more effectively. Therefore, new information that enters long-term memory activates related information in long-term memory to enhance the retrieval of information (Nairne, 2002). Information needs to be processed in short-term memory before being sent to be stored in long-term memory (Dehn, 2010).

2.3. Working Memory

Short-term memory is believed to be part of working memory (Dehn, 2010), which processes information that is briefly stored in short-term memory to perform complex tasks (Hulme & Mackenzie, 1992). Working memory can use information stored in both short-term and long-term memories. Moreover, information is consciously processed in working memory for performing complex cognitive tasks that govern learning and thinking (Dehn, 2010). Working memory draws on different memory systems, which makes learning possible for individuals (Dehn, 2008).

Some researchers believe that, like short-term memory, working memory comprises verbal and visuospatial components. The verbal component involves encoding phonological input collected and stored by short-term memory or verbal information in long-term memory (Dehn, 2010). The visuospatial component, however, deals with forming visual imagery (Gathercole & Baddeley, 1993).

However, Baddeley (2003) believes that working memory contains a central executive core and controls components of the short-term memory system. Furthermore, complex cognitive processes seem to be coordinated by working memory. Simultaneous processing and storing of information call upon the central executive core of working memory, making these tasks impossible for the individual. Moreover, executive working memory is responsible for selective attention to information, choosing which task to perform, planning and executing plans, summoning information from long-term memory, and remembering (Dehn, 2010).

The episodic buffer is another component of working memory whose capacity seems limited (Baddeley, 2006). It directly encodes information into long-term episodic memory and interfaces with semantic and episodic components of long-term memory (Pickering & Gathercole, 2004). It plays a very important role in acquiring new information and learning. It seems that working and short-term memory depend on each other, and, at the same time, they can function independently. The capacity of short-term memory gives working memory enough time to process information (Dehn, 2010).

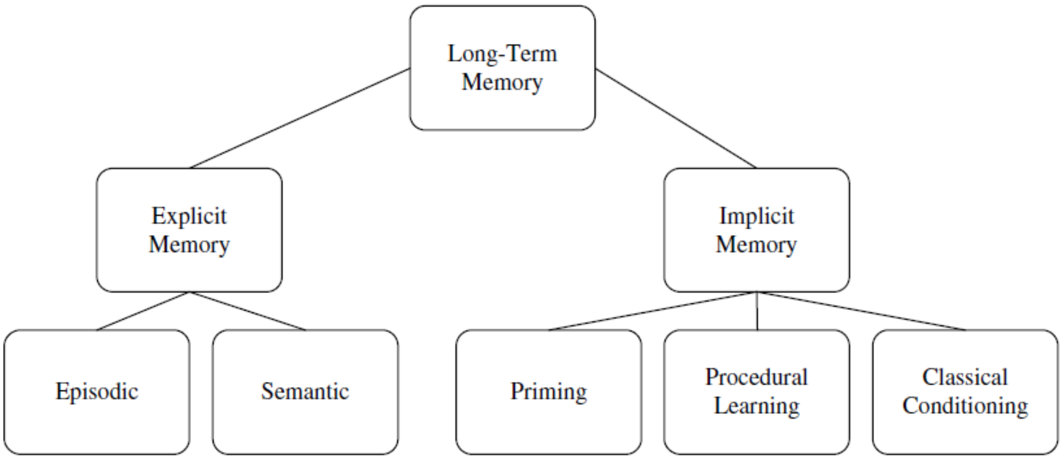
Working memory also affects and is affected by long-term memory (Ericsson & Kintsch, 1995), as it is active while information is remembered or encoded for storage in long-term memory (Rosen & Engle, 1997). Long-term memory enhances working memory's capacity by making schemas available (Unsworth & Engle, 2007). When acquired knowledge becomes automatic, the capacity of working memory is freed as less processing is required. Therefore, working memory stops the effortful processing of information (Logie, 1996).

While one's learning is directly related to the capacity of working memory, as it is responsible for cognitive functioning and learning, we know that its capacity is restricted (Dehn, 2008). Therefore, efficient employment of working memory while learning new points seems crucial (Dehn, 2010). One needs to consider factors that affect working memory capacity so that information acquisition is done more effectively. Attention, emotions, senses, etc., have been shown to positively affect memory enhancement.

2.4. Long-Term Memory

Many scholars have noted the integral role of long-term memory in learning (e.g., Henke, 2010; Rolls, 2000). Part of the processed information in short-term memory is transferred to long-term memory and is stored for further retrieval. Several divisions have been proposed for long-term memory. It can be divided into explicit and implicit memory systems (Dehn, 2010). Figure 1 shows different categories of long-term memory.

Figure 1
Long-Term Memory Systems (Dehn, 2010)



2.4.1. Explicit Memory

Explicit memory, also known as declarative memory, is further divided into episodic and semantic memory, while implicit memory, also known as procedural memory, is divided into priming, classical conditioning, and procedural learning (Dehn, 2010).

The information stored in explicit memory, primarily responsible for storing facts and concepts (Ashcraft, 1989), is "the repository of the speaker's explicit knowledge" (Segalowitz, 2010, p. 14) and is thus consciously available. Episodic memory - part of explicit memory - stores past experienced events (Segalowitz, 2010), while semantic memory stores and deals with "word meanings, facts, concepts, and general world knowledge" (Jones et al., 2015, p. 232). It must be noted that both memory systems rely on world knowledge and autobiographical knowledge. These two memory systems overlap in processing and storing data (Tulving, 1993).

As mentioned above, *Episodic Memory* stores and helps us remember incidents and events we have experienced. More specifically, when individuals encounter someone or something new or have new experiences, these are stored in episodic memory and processed there (Williams et al., 2008). Many scholars believe this memory has been ignored and not studied much (Tulving 1983, 1985). According to Tulving (1983), episodic memory 'is the form most familiar to the proverbial man on the street, yet it has received little direct attention from psychologists or other scientists' (p. 1). Tulving (1972) first put forward the idea of episodic memory. Its autobiographical nature was primarily attended to; however, recent research has focused on its episodic nature, i.e., recalling information in episodes. When individuals learn something new, information is initially stored in episodic memory in episodes. Therefore, when individuals remember such information, they remember when, where, and how they acquired it (Dehn, 2010). For episodic memory to store and remember information, one must ensure that learning happens in context to form meaningful episodes for later remembrance. Consequently, learning that focuses on the enhancement of episodic memory takes longer as learners need to experience to learn.

Unlike episodic memory, *semantic memory* does not recall the context in which learning occurred. It stores information regardless of the way it was acquired. Therefore, it includes general knowledge, concepts, and factual information (Martin, 1993). It is limitless, and it is not immediate like episodic memory. As learning deals with understanding and recalling facts and concepts, semantic memory is believed to be the memory system that traditional schooling and education depend on (Dehn, 2010). It seems that academic concepts are stored episodically first and then transferred to semantic memory for long-term retention and retrieval, i.e., when information acquisition occurs, information is stored in episodes. However, the stored knowledge gradually becomes semantic, and the individual retrieves it without remembering the context or the learning events (Conway et al., 1997). The process through which concrete, episodic knowledge becomes abstract, conceptual knowledge is not yet known (Dehn, 2010). Unlike episodic memory, semantic memory deals with facts, and if information needs to be acquired quickly, there will be no time for enhancing episodic memory.

Scientists believe that episodic memory seems to lead to the development of semantic memory. Individuals seem to have a deficiency in semantic memory whenever their episodic memories are impaired (Sohlberg & Mateer, 2001). However, repeated learning opportunities may compensate for this impairment (Temple & Richardson, 2006). Episodic memory also seems to rely on semantic memory as semantic memory develops before episodic memory (Tulving & Markowitsch, 1998). The manner in which these memories influence each other has not been identified; however, they appear to interact and influence one another.

2.4.2. Implicit Memory

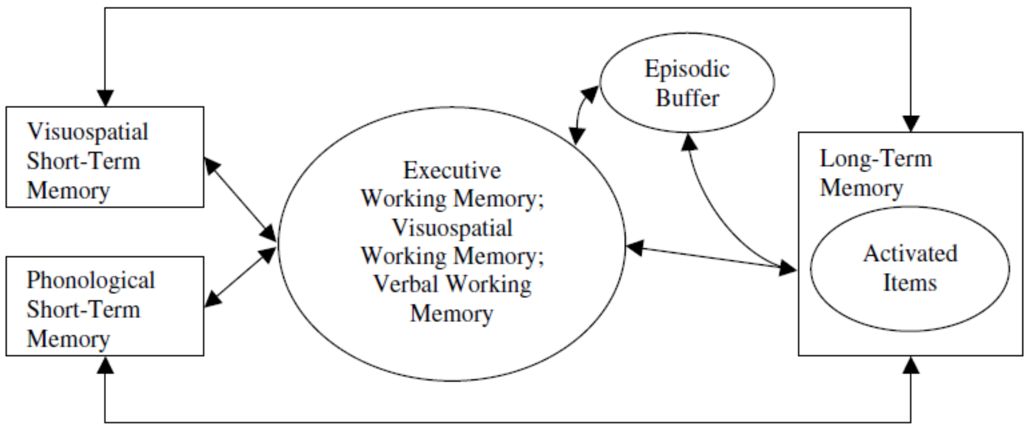
Unlike explicit memory, *implicit memory* needs no conscious attention and is inaccessible to conscious awareness as it functions subconsciously. It does not occupy the individual's attentional resources and the working memory's capacity. It comprises priming, classical conditioning, and procedural memory. Among these three systems, priming, which involves remembering information by seeing or hearing a cue (Dehn, 2010), is more widely studied. Skills and habits constitute procedural memory. It deals with knowing how to do things. Therefore, mental procedures and movement-oriented activities are the functions of procedural memory (Martin, 1993). It is believed that when individuals acquire a skill, they do not need to remember the training procedure consciously. Therefore, it is part of the implicit memory. Finally, classical conditioning refers to the relationship between a neutral environmental stimulus and the response it evokes (Dehn, 2010). Unlike explicit memory, implicit memory functions even after an individual loses their memory completely (Yeates & Enrile, 2005).

Tulving (1985) stated that episodic and semantic memory are directly related to procedural memory. He maintained that what an individual learns via stimulus-response relationships is remembered through procedural memory. He noted:

> Semantic memory is characterized by the additional capability of internally representing states of the world that are not perceptually present. It permits the organism to construct mental models of the world ... models that can be manipulated and operated on covertly, independently of any overt behavior. Episodic memory affords the additional capacity of acquisition and retention of knowledge about personally experienced events and their temporal relations in subjective time and the ability to mentally 'travel back' in time. (p. 387)

The relationship between different memory systems is summarized in Figure 2. Overlearning has been shown to affect long-term information retention in long-term memory (Joiner & Smith, 2008).

Figure 2
The Relationship between Memory Systems (Dehn, 2010)



2.5. Long-term Memory Processes

When information is received, it has to be processed in several ways to be stored in the long-term memory and to be accessible later on. Information is encoded, consolidated, and retrieved to be remembered easily. The received information must be encoded so long-term memory can store it. Therefore, the input is transformed into the form it can be stored, and the received data goes through modifications. This is mainly done unconsciously. Although encoding is done unconsciously, individuals consciously try to commit information to their long-term memory through deliberate practice (Dehn, 2010).

It is believed that if deep, meaningful learning happens, information is stored better and recalled more easily later (Craik & Lockhart, 1972). Moreover, the recall rate of stored information increases if the cues present while storing information are present at retrieval (Hannon & Craik, 2001). Therefore, contextual cues play an essential part in recalling information. This is due to the nature of episodic memory and how it stores information. Afterward, information is processed and stored for further retention. Storage is a nonconscious process; however, it can be facilitated by activities one chooses to enhance one's memory function (Dehn, 2010).

Consolidation happens when one’s brain is trying to store information. This helps a memory be remembered more clearly and be more accessible. It might take quite long before memory is consolidated (Dudai, 2004). If consolidation does not happen, the information is forgotten and cannot be retrieved. Retrieval is remembering already stored information, which is performed through the automatic process of bringing information into the conscious mind and the conscious search for information (Koriat, 2000). These processes can affect learning and teaching as memory and learning are directly related.

3. Memory and Education

Different memory systems seem to have distinct effects on learning (Henke, 2010). Rolls (2000) described different brain systems that affect memory functions, which has provided a neurobiological basis for the different effects of long-term memory systems on learning.

Education also affects memory, as a site for constructing, communicating, and contesting memories (Paulson et al., 2020). Memory seems to be the only evidence for optimal learning and development (Banikowski & Mehring, 2017). It has to be noted that paying enough attention to principles of cognitive development and cognitive psychology can have an outstanding influence on learning and teaching, as learning is intertwined with working and long-term memories and their capabilities.

In childhood education, working memory is of utmost importance as it affects academic performance and learning as it stores information temporarily for further processing. It functions differently from long-term memory, but its role is crucial to optimal learning and development (Cockcroft, 2015).

As a result, if working memory functioning is impaired, cognition, development, and learning will be negatively affected. This occurs due to an individual's inability to extract the necessary information and skill learning, which affects an individual's educational progress. By helping students attend to learning, educators can enhance their working memory capacity. Working memory is believed to play an integral role in planning, comprehension, reasoning, and problem-solving, all of which can facilitate learning. Moreover, if individuals do not employ working memory sufficiently, their understanding of new issues is impaired. Working memory correlates with fluid intelligence, and fluid intelligence assists learners in staying focused on a task, so the importance of working memory cannot be ignored (Cowan, 2014).

Working memory impairments can be targeted through interventions and effective management of the information load on the working memory. Moreover, teaching effective strategies compensates for individuals' working memory difficulties (Cockcroft, 2015). Pishghadam (2016) proposes emotiency as a facilitator of working memory. He believes that this sense-emotion relationship can reduce the cognitive load, allowing working memory to function more easily and process more information.

Long-term memory systems also affect learning and education. Semantic and procedural memory have long been studied in education and learning new information, and their roles have been considered in learning and teaching in a classroom context (e.g., Dembo, 1991; Pressley & Levin, 1983). Many scholars presume that the primary source of learning stems from semantic memory. Those focusing on episodic memory often conduct studies in controlled environments, limiting the generalizability of their findings to real-world classroom settings where learning experiences differ significantly from highly controlled conditions (Estes, 1989). Furthermore, episodes are remembered only when an event makes that episode unforgettable, and such events are more likely to occur in real classroom settings (Slavin, 1991). This is evidenced by individuals remembering memories from school years after their schooling has ended (Martin, 1993).

It seems that episodic memory leads to better remembrance of personalized accounts of the learning context (Nuthall & Alton-Lee, 1990). Information will be stored as experiences. As Tulving (1985) also showed, classroom experiences are stored in the students' episodic memory, and students form certain emotions, attitudes, and motivations toward these experiences that are unique to each individual. Students' episodic memory of their classroom experiences can cause the acquisition of procedural and declarative knowledge types. Moreover, one's declarative and procedural knowledge can affect the information stored in episodic memory in new learning contexts (Martin, 1993). Individuals also benefit from cognitive training as it improves episodic memory (Miotto et al., 2020). As learning develops, learners' knowledge shifts from episodic to semantic memory. When learners keep reviewing the acquired knowledge, learners' 'remembering' of information will become 'knowing' the information (Herbert & Burt, 2003).

Teachers' role in assisting individuals to enhance their memory functions is undeniable. If educators consider learners' performance on different tasks, they can design tasks within the capabilities of their working memory so they benefit from tasks whose difficulty level fits the limitations of their working memory (Cowan, 2014).

In addition, teaching learners to use memory-enhancing techniques leads to better learning opportunities and helps learners control their learning. To increase their memory, learners have to learn to concentrate on what is being taught. Moreover, they have to connect new information to previously acquired information for learning to occur. Active engagement in the learning process is another factor that can lead to better commitment of information to memory, which is an essential part of any learning practice. In addition to storing information, individuals have to learn information retrieval and demonstrate the learned knowledge in the proper context (Banikowski & Mehring, 2017).

Involving learners in the learning process (Slavin, 1991) and cooperative learning (Slavin, 1995) are two other techniques that lead to higher memory functioning and more effective remembering. Learners learning cooperatively have equal participation opportunities as they interact to learn. This can enhance their memory. Reciprocal teaching and learning is another effective teaching technique to enhance memory and its functioning. This teaching strategy activates learners and helps slow learners (Snow et al., 1998). This instructional strategy focuses on summarizing, asking questions, making predictions, and clarifying (Banikowski & Mehring, 2017). Studying knowledge retention indicates that learners' active engagement in learning contexts affects their learning (Martin, 1993).

In recent years, the effect of emotions on learning has also been investigated, and it has been shown that emotions affect the learning process positively. Emotion has a significant impact on a person's memory and learning because it is involved in information processing-related brain functions. Moreover, scholars have attended to the effects of emotion on attention, concentration, learning, perception, reasoning, problem-solving, and decision-making (Halkiopoulos et al., 2022). Pishghadam (2015) has already underlined the importance of senses and emotions in enhancing learners' cognitive abilities, one of which is memory. Research has shown that combining senses can affect learning and better remembering of information (Shayesteh et al., 2019). When more emotions and senses are involved in the learning setting, the probability of retention of information and memory enhancement increases as these senses are those the learners have experienced (Pishghadam & Shakeebaee, 2020).

Besides these teaching methods, teachers' teaching techniques can lead to more effective strategy use among learners. Such learners can employ more efficient cognitive processing strategies, which leads to better recall of acquired information (Moely et al., 1992).

Thus, different teaching methods affect the storage of information in long-term memory, its retrieval, and, as a result, learning to a great extent. It has been shown that teaching methods can affect knowledge retention along with learners' curiosity for finding information and their desire to find answers to questions raised in the classroom. Teaching methods that are research-centered are found to affect the performance of long-term memory significantly. When instructors utilize research-centered learning techniques, retention of new information is improved compared to when teachers choose lecture-based methods (Rassaian, 2001).

In the same vein, Van Eynde and Spencer (1988) concluded that experiential learning promoted long-term memory more effectively than lecture-based learning as it involved learners. He maintained that it leads to a higher intrinsic motivation among learners and helps them enjoy the learning experience compared to lecture-based instruction. Nemati (2009, 2010) has also supported the aforementioned findings. Moreover, he proved the importance of memory and vocabulary learning strategies in the long-term retention of information. These studies underscore the integral role of active, engaging, and exploratory teaching methods in enhancing one's long-term memory. Individuals will store and later remember information better if they are fully engaged in the lesson.

This highlights the need for multisensory teaching as a means of facilitating learning. It seems that the creation of learning contexts that are rich with sensory input can lead to better learning, which in turn might improve the functions of memory (Seyednozadi, 2021; Shayesteh, 2019). Learners' engagement and motivation seem to enhance when senses and emotions are involved in learning (Gholami, 2020; Pishghadam, 2021). This can also lead to better information retrieval.

Scholars have also shown that individuals can be trained in the deliberate use of remembering strategies and can develop their skills in utilizing such strategies (Ornstein et al., 2010). It can be inferred that teachers who provide learners with metacognitive information help learners develop deliberate strategies for remembering (Coffman et al., 2008). If teachers expose learners to memory-rich teaching, they develop greater strategic knowledge and exhibit more sophisticated strategy use. Therefore, the teacher's language and teaching techniques seem to determine learners' strategic efforts. Hence, teachers' use of memory-relevant language can affect learners' utilization of mnemonic skills and memory strategies (Grammer et al., 2013).

Learners' belief about the efficiency of their memory and how effectively they remember learned information is another factor that can significantly impact their episodic memory (Nikdel et al., 2009). It has been demonstrated that teaching methods that enhance semantic memory can also improve episodic memory (Miotto et al., 2020). Episodic memory performance can be developed by mindfulness training as mindful attention benefits its performance. This supports the finding that training in sensory encoding can lead to long-term enhancement. As the learner attends to the mindful task and is engaged with it, their working memory is enhanced, leading to better episodic memory performance (Brown et al., 2016). This implies that teaching methods that enhance memory self-efficacy can promote semantic memory, and incorporating mindfulness training can enhance both semantic and episodic memory. These studies and the effect of education and teaching methods on memory can have implications for teachers and educational contexts.

4. Concluding Remarks

As the reviewed literature shows, scholars have focused on memory, different memory types and functions, and their relevance to education, teaching, and learning for decades. Teachers' focus on equipping learners with memory strategies can affect their learning to a great extent and can lead to better retention of information. Needless to say, teaching these strategies has to become an inseparable part of every educational system for learners to benefit from their schooling. Learned at school, these techniques can help learners benefit from the educational setting as these strategies can enrich their education so they can handle later real-life events most efficiently. What they learn in the educational setting can be transferred to other life contexts. These memory strategies can be utilized in different contexts and enable working memory to send information to long-term memory for storage and retrieval.

As the final purpose of any educational system is preparing learners for effective functioning in real-life contexts, teachers must pay attention to the relevance of educational tasks to learners' real lives and future needs. It has been shown that learners' engagement in the educational system leads to memory enhancement; therefore, relating what learners acquire to their lives should be the purpose of all educational settings. When teachers link what they teach to learners' real lives outside the educational context, information retention is done more easily, and learners remember the information more easily. This can be due to the fact that familiar settings might trigger better learning and data retention.

Unlike teaching techniques that focus on rote learning and lecturing, teaching methods that engage students and focus on reciprocal and cooperative learning enhance memory and its functioning. This can be because such educational settings form autobiographical episodes that can be remembered long after the learning event. Learners will experience an unforgettable situation that forms episodes that can be stored in their episodic memory. This highlights the importance of the utilization of techniques that improve episodic memory. For better remembering, learners can access information acquired as episodes more efficiently and use it whenever needed. When teachers make the learning context memorable, learners struggle less with information retrieval and can use that information more easily. This knowledge is transferred to their semantic memory later, and they will remember it as a learned fact.

Details of learning events in classroom contexts can be learned better if teachers link them to learners' experiences. Enhancing learners' episodic memory through different delivery techniques can lead to better knowledge retention. When learners are enabled to relate information to their previous knowledge, they can store and remember information more accurately. An enhancement in remembering procedural and declarative knowledge can also facilitate learning and future use of learned knowledge.

Although knowledge seems to have to be acquired episodically and then sent to semantic memory for it to be retained, researchers need to consider the time required for this process. A question that must be raised is whether there is enough time for all learning situations to create episodes to make remembering information easier for the learner. It appears that teachers often lack the time to generate memorable learning episodes for students across all learning contexts, and they cannot consistently depend on situations where learners are fully engaged. As a result, more opportunities for creating episodes in the educational setting will likely lead to better information retrieval. Teachers seem to have to take a different course of action in these contexts.

In dealing with insufficient time to create the necessary context for acquiring information, teachers can rely on techniques that directly send information to learners' semantic memory. This can lead to a faster transfer of information, and it usually happens when the learner has to be provided with a high amount of information in a short period to perform better on a test or in a specific context. This does not guarantee consolidation of information but will lead to effective learner performance on the task the teacher is preparing them for. Therefore, it should be highlighted that not all learning can be through effective context building and engaging of the learners as sometimes, tasks that teachers need to prepare their learners for do not align with the principles of cooperative teaching methods.

In such educational settings, learners must directly commit information to their semantic memory. As time limitations prohibit the teacher from diverging from lecture-based teaching, the teacher tries to communicate large amounts of knowledge quickly so the learner can benefit from the instruction. Therefore, teachers in these settings focus on learners' semantic memory and use techniques that help learners memorize information so that they can transfer large amounts of information in the shortest amount of time possible.

As a result, it can be concluded that it is not always efficient to commit information to episodic memory. While senses and emotions do affect learning to a great extent, sometimes, one needs to speed up the process of learning, and as a result of these circumstances, one needs to choose techniques that lead to faster learning of information, even if that means the information might be forgotten sooner in comparison to the time when one uses episodes to remember information.

Few studies have tapped into the efficiency and necessity of these techniques. Hence, further research is needed to study different instructional contexts and investigate the efficiency of instruction based on the learners' memory needs. More studies have to take into account the functions of episodic and semantic memories and show how memory enhancement can lead to better learning in different situations.

Moreover, neurobiological research needs to focus on different instruction settings in the light of different memory systems. These studies can shed light on more effective teaching techniques in different settings. If the needs of learners in different instructional settings are accommodated, education will likely be more efficient.

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