BRAIN-BASED AND LEARNING THEORIES: APPLICATION OF THEORIES IN THE CLASSROOM

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Abstract:

Memory and learning are inseparable concepts in education. Memory influences learning, at the same time, Learning influences memory. This shows how Memory and Learning are strongly linked. Memory is a well-organized Machine. Memory is composed of systematic and well-coordinated structures. This implies that teaching and learning process, to be successful, should take into consideration memory structures and how it functions. Simply, teaching and learning must also be systematic and well-organized to allow the memory to encode and retrieve information. The studies show that memory can affect encoding and retrieval capacity. Teaching and learning are meaningfully influenced and guided by brain-based and learning theories relevant to teaching and classroom practices. Learning theories have significantly impacted teaching strategies and they are relevant to learning in the classrooms. The learner's ability changes over time as a result of both maturation and experience. One of the most important information processing capacities a child develops is the ability to organize information. This is, in turn, influenced by the child's ability to categorize. As is the case with other information-processing capacities, this ability changes with both maturation and experience. The level and stages of students are different. Students' levels and stages should be considered when preparing and delivering lessons in terms of content, strategies, and teaching materials. The discussion and recommendations focused on the important learning theories found to be influential in teaching and learning English language: (1) Memory Storage and Retrieval Strengths theory; (2) Social Development of Learning Theory; (3) Communicative Language Teaching Theory; (4) Game-Based Learning Theory; (5) Family Influence Theory; (6) Zeigarnik and Interleaving Effect Theory; (7) Perceptual Discrimination Theory; (8) Studying and Testing Theory; and (9) The Theory of disuse.

Keywords: learning theory, brain, memory, teaching, learning, classroom

1. Introduction

Memory is composed of systematic structures. Neisser (1967), one of the most influential researchers in cognition, defines memory as the structure of how people encode, structure, store, retrieve, use or otherwise learn knowledge. Memories have retrieval and storage strengths. Storage strength can increase, but never decreases. Carey (2014) explains the structure of brain and makes more understanding of development on how the brain stores and retrieves. Carey identified the types of memories (episodic, motor learning, and semantic) and their functions. She mentioned that using our memories changes our memory. Some parts of our memory remain in operations while we are at sleep, the left side of the brain is wordsmith and the right side is the visual experts, and the fact that we have thousands brain modules that performs several skills like calculating changes in light, tone of voice, and changes in facial expression, and they all run at the same time.

Schacter and Tulving (as cited in Driscoll, 2001) state that "*a memory system is defined in terms of its brain mechanisms, the kind of information it processes, and the principles of its operation*" (p. 283). Carey (2014) in his book indicates the types of memories (episodic, motor learning, and semantic) and their functions. Carey states that episodic memory is used to remember events that take place over time like the first day of high school. On the other hand, the semantic memory deals with facts rather than experiences. Motor learning memory deals with the remembrances of physical skills like swimming, kind of walking, and parading. Tulving's (1972) theory of memory draws a distinction between general knowledge (semantic memory) and memory for events (episodic memory). Neuropsychological studies have generally examined each type of memory in isolation, but theorists have long argued that these two forms of memory are interdependent. Here we review several lines of neuropsychological research that have explored the interdependence of episodic and semantic memory.

The studies show that these forms of memory can affect each other both at encoding and at retrieval. Tulving's influential theory proposes that human memory can be divided into at least two subtypes. Tulving states that Semantic memory consists of a "*mental thesaurus*" that provides "*the memory necessary for the use of language*" (p. 386), whereas episodic or autobiographical memory consists of memory for "*temporally dated episodes or events, and the temporal-spatial relations*" among them (p. 385). Therefore, Studies illustrate interdependencies between episodic and semantic memory at encoding, but other work has shown that these forms of memory can interact at retrieval as well. In a recent study (Greenberg, Keane, Ryan, & Verfaellie, 2009)

Carey (2014) mentions that the fact of using our memories changes our memory. This indicates that every time we use and access memory, we change it a little bit. We recall different details and intertwine the memory with other memories. The act of finding and recalling memories increases the storage strengths and retrieval strengths. Working hard to retrieve something will increase both storage and retrieve strengths when we finally retrieve it. This principle is called *desirable difficulty*.

2. Discussion: Teaching and Learning Theories

Teaching and learning are meaningfully influenced and guided by brain-based and learning theories relevant to teaching and classroom practices. Learning theories have significantly impacted on teaching strategies and they are relevant to learning in the classrooms. The discussion mainly focuses on the important learning theories found to be influential in teaching and learning English language: (1) Memory Storage and Retrieval Strengths Principles; (2) Social Development of Learning Theory; (3) Communicative Language Teaching Theory; (4) Game-Based Learning Theory; (5) Family Influence Theory; (6) Zeigarnik and Interleaving Effect Theory; (7) Perceptual Discrimination Theory; (8) Studying and Testing Theory; and (9) The Theory of disuse.

A. Memory Storage and Retrieval Strengths Theory

The first theory mostly related to my classroom that is found relevant is the *memory storage and retrieval strengths principle*. According to Carey (2014), "*the first principle theory is that any memory has two strengths, a storage strength and retrieval strength*" (p.36). He further added the desirable difficulty principle to support memory storage strength and retrieval strengths: "*the harder your brain has to work to dig out a memory, the greater the increase in learning (retrieval and storage strength)*" (p.82). In classrooms, memory storage and retrieval strength are the mainly focused to ensure that students have captured, and they can remember what they studied in classrooms. For instance, various strategies are put into practice specifically Socratic questions, essays and open ended questions are used to encourage students towards critical thinking. Formative tests to students are part of learning and teaching to enable students remembering what they have acquired and increase the storage and retrieval strengths. Immediate feedback is also given to students to correct the. Additionally, students are given time to apply what they have learnt in the real-life situation sing role plays, debates, and presentations in classrooms. The preparation of the lesson before teaching helps me to systematically organize information and deliver the content in steps in a such way that it is easily captured by students following the steps of a lesson delivery (introduction, development, application, and summary).

Carey (2014) stated that "*learned information, without continued use, decays from memory entirely*" (p.29). Mixed practices are emphasized in my classrooms to fight against the decay of information in the memory of students. Students are constantly given assignment, continuous assessment tests, quizzes and homework. The assignments given to students will be part of the discussion in the classrooms during the correction and feedback is provided by the teacher. Carey added that "*the retrieval strength increases with studying and with use. Without reinforcement, however retrieval strength drops off quickly and its capacity is relatively small (compared to storage)*" (p.37). Reinforcement strategies are used to enable students store and retrieve information. For example, identification and explanation of the key terms of the lesson, use of tables, charts, diagrams, figures, pictures, revision before teaching and summary of lessons after teaching are used in my classrooms to support students learning environment in

terms of memory storage and retrieval strengths. Houston (2001) analyzed the basis of human learning and memory presented in theoretical and experimental psychological research. According to Houston, retention processes cannot be separated from the acquisition and transfer parts of the entire learning process defined as "*a relatively permanent change in behavior potentiality that occurs because of reinforced practice*" (2001, p. 4). Repetition and reinforcement strategies are frequently used to ensure the smart storage and retrieval of information.

English short stories constitute a good illustration of impact of teaching strategies on the memory storage and retrieval strength. English short stories hold the moral lesson to students which must be taught in a defined context. A short story like *Have You Filled a Bucket Today? A Guide to Daily Happiness for Kids,* Carol McCloud is taught in such way that can impact memory storage and retrieval capacity. McCloud (2006) used a bucket filler to illustrate how being kind to others helps others to feel happy. On the other hand, McCloud says that a bucket dipper is used to signify the persons who is not kind to others and who does the actions that make others feel unhappy or uncomfortable like using hurting words, and aggressive. The book outlines the various moral lessons like caring, discipline, respect, kindness, social justice, collaboration, thankfulness, love, positive attitude, consideration of family members, taking care of old people, recognition, tolerance, self-discipline, self-control, perseverance, creativity, love of family members, a strong work ethic, hardworking, effort, civic quality like greeting the people in the community, human right respect, helpfully, participation in the community, home, and school community services. Therefore, as an English teacher, the explanation of the new or key words is very important, the context, the denotation and connotation of words needs to be clear to students, the metaphor used in the text, comparison, the central or subthemes themes of the text, figures of speech, and summary of the text. Purposive selected questions are asked to students to emphasize on critical thinking and application of the moral lesson contained in the text. Carey (2014) stated that the contextual cues are very significant in terms of memory storage and retrieval capacity. The comments and explanation of the short story, as contextual cues, significantly add strength to storage and retrieval of the memory. Therefore, the comments, contextualization, and explanations provide the brain cues to store and retrieve more information about the short story and practice in their real life.

B. Social Development of Learning Theory by Lev Vygotsky

The second theory that greatly influenced my classroom practices is social development of learning. Lev Vygotsky was born in the U.S.S.R. in 1896. He lived during Russian Revolution, a time of great change in his culture. Vygotsky, a well-known Russian teacher and psychologist, is the originator of the social development theory of learning. He proposed that social interaction profoundly influences cognitive development. Vygotsky's theory says that biological and cultural development does not occur in isolation (Driscoll, 1994). Vygotsky (1962) assessed how the social environments influence the learning process. He suggested that conducive learning occurs when

students interact with their peers, teachers, and other experts. Social learning theories helps me to understand how people influence each other in English learning environment. Effective language learning occurs in social contexts through interactions. Social development theory of learning also informs teachers on how we can construct active learning communities.

Vygotsky's two important concepts raised up my consideration due to their relevant practicability in the learner-centered English classrooms' environment. The concepts of *Scaffolding* and the *Zone of Proximal Development* provide a useful realistic view of how students learn in one on one and group settings with the support of competent persons. The concepts are relevant today in the sense that teachers are supposed to act as facilitators and students get actively involved in their English learning activities. Responsibility and involvement of students are very important and significant in English learning environment. Lev Vygotsky's theory is mainly focused on how students actively learn through social interactions. The theory is learner-centered oriented in its conception. *Scaffolding* is a metaphor which describes and explains the role of the adult or more competent and knowledgeable peers in building and guiding children's learning and development activities (Hammond, 2002). The popularity of scaffolding metaphor indicates its conceptual significance and practical value for teaching and learning.

The term scaffolding metaphor expresses the effective role of quality teachers' intervention in learning. On the other hand, the zone of Proximal development is at the heart of Scaffolding. The Zone of Proximal Development bridges the gap between what is known and what can be known. Vygotsky describes it as "*the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers*" (Vygotsky,1978). Vygotsky stated that learning occurs in this zone. Additionally, Moalosi (2013) indicated that students cannot succeed alone in classrooms' social interactions. As they learn, they need to be helped in interacting with *more knowledgeable others*. Through these interactions with adults or experienced peers, students will learn how to tackle and solve different kinds of problems. This shows that students need guidance of the competent teachers in social interactions and social activities in the classrooms. The child can be thought of entering relations with the situation, not directly but through the assistance of the other capable person. The theory explains students' successes when we look at learner-centered context that is created by an adult who has a major role in the learning process (Moalosi, 2013).

Vygotsky's social development theory of learning emphasized that students as people are constructed by interacting with other people. Without interacting with more knowledgeable others they may not succeed in their learning settings. As a teacher, the theory is the most influential in English teaching and learning environment. The theory joins forces to learner-centered approach's role of the teacher who is a facilitator in learning activities. In my English classroom, students learn from others through collaboration, observation, imitation, experiments, practice and experiences. Therefore, a gigantic responsibility, as a teacher, is always added to my practice to continually

create an English learning environment which enables students' interactions and exchanges of skills and knowledge. As facilitator, guidance and direction is very important to ensure that students meticulously accomplish the task without challenges. In my English classrooms, students practically interact through peer discussion, debates, group work, collaboration, experiments, Socratic dialog, role play, engaging questions, and constructive feedback from the teacher.

In secondary schools, adolescent needs intensive guidance and directions in the English classroom activities. When the guidance and direction is minimal they can deviate from the assignments given. For instance, when the group work assignment is given in the classroom, the guidance is provided to each group to ensure that students are doing the right things, at the right time, and at the right place. Group work instructions are clearly defined and responsibilities allocated to each member of the group to avoid role conflicts in group members. If students face challenges, under guidance, the clarifications and explanations are given to students. This indicates that students always receive the support from the competent and knowledgeable person, the teacher, to effectively accomplish the collaborative activities in the classroom.

As a teacher of English language, a second language to my students, the determination is to continually purpose to use social interaction activities in my classrooms to expose my students to new language structures for language mastery and development. This supports my teaching activities which aim at developing four language skills specifically listening, reading, writing, and speaking. Vygotsky argued that "*language is the main tool that promotes thinking, develops reasoning, and supports cultural activities like reading and writing*" (Vygotsky 1978). Language is a socialization agent and tool that enables people to interact and communicate. Through intensive and systematic organized debates, presentations in classrooms, role plays, and group discussions, students interact and share experiences in learning new language which is English.

C. Communicative Language Teaching Theory

The modern approach in teaching languages which brings support to social development of learning is communicative language teaching. Richards (2006) stated that communicative language teaching involves the focus on important aspects such as the use of language for different purpose and functions, the use of languages in formal or informal speeches, maintaining communication, producing reports, interviews, and conversations. He further mentioned that learners in communicative language teaching views language teaching as mastery of communication. In my English classrooms, students effectively learn when there is interaction between learners and users of the language, collaborating and paying attention to the use of language in different situations, and when trying it out and experimenting the way of saying things. Richards specifies the activities that promote language mastery like dialogs, group discussion, role plays, public speaking and presentations. Therefore, the social interaction with guidance of the teacher is a constant support to communicative language teaching activities for students' language mastery. Languages are predominantly acquired from

sharing with others when it is used in the real-life situations. Corrections and constructive feedback from the expert of the language is also very significant.

The social interactions in my English classrooms continually help my students to develop the mastery of the language structure and speaking skills. This provides me a huge responsibility of selecting appropriate class activities that involves social interactions in classroom. The guidance must be recurrently planned and envisaged. Vygotsky's social development theory of learning provide rich guidance on how social interactions in the classroom leads to the successful English classroom environment. The teachers of English, as the experts of the subject, are recommended to be the significant facilitators of the social interactions in their classroom when delivering the content to students to insure the successful implementation of learning activities.

E. Game-Based Learning Theory

The forth learning theory that impacted my teaching practices in the classroom is game based learning. The use of games in classroom significantly impacts students' learning. Perrotta et al. (2013) stated that game-based learning broadly refers to the use of games to support teaching and learning. Additionally, game-based learning is defined as the borrowing of certain gaming principles and applying them to real-life settings to engage users or students' in learning (Trybus, 2015). Trybus further stated that the motivational psychology involved in game-based learning allows students to engage with educational materials in a playful and dynamic way. Game-based learning is not just creating games for students to play, it is designing learning activities that can incrementally introduce concepts, and guide users towards an end goal. Games can incorporate competition, points, incentives, and feedback. The concept has become increasingly popular in education to engage students in learning.

Game-based learning closely connects the classroom activities to the real life. It positively impacts the students' learning experiences. It influences learning experiences in a sense that it provides challenging opportunity to students, repetition, and the rehearsal opportunity. The games are kinds of reinforcement activities. Games shape the memory. Carey (2014) stated the principle of desirable difficulty which says that the fact of using our memories changes our memory. This indicates that every time we use and access memory, we change it a little bit. Games play a significant role to facilitate the storage of information and increase the retrieval capacity of students.

Using game-based learning in the English classrooms, we provide opportunity to students to continually use the information for a long time. The students find opportunity to apply what they have learnt in the classroom. The preparation of games keeps students at work and increase the storage and retrieval capability of memories. Carey (2014) mentioned the theory of disuse which states that learned information without continued use, decays from memory entirely. This means that game-based learning support learning in the sense that information is continually used for a long time. The game-based learning strategy also provides my students opportunity for using mixed practice learning activities and creative problem solving. Carey emphasized that varied practice in learning is more effective than the focused kind.

Varied practice works best in the long run for both motor and verbal learning. What could be the best games that emphasize creative problem solving that we could implement in our classrooms?

As an English language teacher, games are found very supportive in learning. Games like Simon says, role play, sentence race, dialog, puzzles, and chain spelling, meaningfully impact learning. Therefore, teachers are recommended to use games in English language classrooms for supporting learning. Game-based learning is positively supportive to learning environment. Students meaningfully learn in a social way. As a teacher, there is a need to purposively select the gameplay that fits what is intended to be taught in English language classrooms. Using games, learning happens by doing. Game-based learning link the classroom activities to the real life. It positively impacts the students' learning experiences. To all the discussed theories, the family influence is added and very significant to be considered by all teachers due to its influence on children's learning. Its influence is very important and linked to the academic success.

F. Family Influence Theory

The family also plays a significant role in the education of the children. Usher and Kober (2012) stated that "*research has long documented a strong relationship between family background factors, such as income and parents' educational levels, and student achievement. Studies have also shown that parents can play an important role in supporting their children's academic achievement*" (p.1). Additionally, Gottfried, Fleming, and Gottfried (cited in Usher& Kober, 2012) explained that "*research has shown a clear link between parent involvement and children's success in school. Studies have further demonstrated a correlation between parent involvement and children's educational development and subsequent intrinsic academic motivation*" (p.1). This validates that family background considerably influences students' academic performance.

There are three critical challenges to me as a teacher in my school on the need of students and family background: (1) Many parents have not done pedagogical courses to clearly identify their responsibility in education of their children and take care of the needs of students; (2) the second critical challenge is that there are several factors that can hinder parents from providing the full support to children's education; (3) The third critical challenge to me as a teacher in my school is that the majority of students come from the families with parents that have financial constraints, and limited educational attainment.

As a teacher, there are critical challenges related to the influence of the family on students' academic performance that have been challenging my teaching practices: The first critical challenge was that parents are not specialized in all specific subject that the students learn at school. However, parents can play the vital role by encouraging students' feelings of competence and control, and positive attitudes towards academic success regardless their background (Grolnick, Friendly, and Bellas, cited in Usher& Kober, 2012). Parents can promote the culture of good study habits at home; discuss the reading materials with their children. Parents can also create and provide students' opportunity to apply what they have learned from schools. They are also recommended

to set clear and rigorous rules about homework, television watching, use of social media and internet, and use of mobile phones. If not controlled, they can become the source of distraction to students and wastage of time to students (Ferguson, cited in Usher& Kober, 2012). Many parents have not done pedagogical courses to clearly identify their responsibility in education of their children. As a teacher in my school, I have a huge responsibility to support parents and organize the regular meetings or training with parents to remind them their key responsibility in education of their children to influence their academic success in schools. If possible, as a teacher, my purpose or wish is to create a brochure that highlights the parents' role in education of their children. With clear guidance, parents can certainly improve in supporting their children.

The second critical challenge to my work as a teacher is that there are several factors that constitute hindrances to parents from providing the full support to their children. Therefore, parents need to identify and overcome the barriers that can hinder the provision of full support to their children. Today, the work, overtime work, and other activities have become stressors, and time consumers. The outside stressor, time and resource constraints, divorce, and unfamiliarity with the role that parents can play in education have significantly increased (Grolnick, Friendly, and Bellas, cited in Usher& Kober, 2012). As a teacher, there is a need to conduct meetings with parents for sensitizing their role and responsibility in education of their children. Additionally, training will be organized on how parents can balance the work and the home activities to find time for their children and motivate students towards academic success.

The third critical challenge to my school is that most students come from the families with parents that have financial constraints, and limited educational attainment. Some parents do not have sufficient financial resources to support their students and some parents have limited educational attainment or some have not attended the school at all. Children from disadvantaged families tend to have fewer opportunities at home to foster competence, encourage them to find interest or see value in learning, promote autonomous learning, or develop social relationships that support and value achievement (Usher & Kober, 2012). Some parents in my school do not value education of their children due to the limited educational attainment. Despite those limitations, parents should continue to provide stimulating environments and support to children. Even if there financial and educational attainment limited, there is a need to be reminded their responsibility that they have in education of their children. Usher and Kober (2012) stated that "*a research found that a cognitively stimulating environment is a more accurate determinant of children's academic motivation than socioeconomic status*" (p.5). Therefore, there is a huge responsibility to continue collaborating with parents and reminding them their supportive role in the provision and creation of home stimulating environments towards academic success of their children.

G. Zeigarnik and Interleaving Effect Theory

Carey (2014) explained two principles: *Zeigarnik effect, mixed practices or varied practices (interleaving effect)*. The first principle named Zeigarnik effect lead to improvement of the learning process, and the second is related to the role and benefits of mixed practices or varied practices (interleaving effect). This has really pushed me to ask myself the two important questions which are related to learning and teaching profession as well. *The first question* is about what contribution is made by Zeigarnik effect to the improvement of the learning process, and *the second question* is what role and benefits plays mixed practices or varied practices (interleaving effect) in learning.

Zeigarnik Effect significantly contributes to learning. Hammadi and Qureishi (2013) indicated that Zeigarnik Effect is coined after a research made by a Russian psychologist Dr. Bluma Zeigarnik. Zeigarnik Effect explains that people tend to remember unfinished tasks better than finished tasks. When a job is left incomplete it creates a sort of tension and irritation which begs for closure, thus, making it hard for human beings to forget. Zeigarnik effect triggers suspense; a feeling of doubt and nervousness about the result of certain events which keeps the audience glued to a certain situation begging for closure, thus, making it hard for human beings to forget. The teachers are advised to consider longer term assignment that students can devote some time to on a regular basis. After studying explanation about Zeigarnik effect, what could be the best and specific teaching strategies that teachers can implement in the classrooms related to Zeigarnik effect in order to improve learning process and keep students active in learning?

Learning interruption has been demonstrated as useful learning strategies and technique that can improve comprehension and retention learning. The strategy is also demonstrated as the best to keep students actively involved in learning by working on unfinished work. Carey (2014) stated that *Zeigarnik's studies* on interruption revealed that a couple of the mind's intrinsic biases, or built-in instincts when it comes to goals. He further mentioned that the act of starting a job or a work on the assignment often gives that job the psychological weight of the goal, even if it is meaningless. The second result is that when the work is interrupted in an assignment extends its life in memory and *according to Zeigarnik effect*, the interruption pushes the assignment to the top of our mental to-do list. This kind of interruption creates suspense and pushes the unfinished project to the top of our mind, leaving us to wonder what comes next. Studies show that we remember more about the tasks that are unfinished than things we have finished. It means that we have a mental do list of the unfinished jobs and unsolved problems that are actively percolating unconsciously (building something what was not there before). This simply means that the interruptions, controlled or uncontrolled, can promote the problem solving and creativity.

Mixed practices or interleaving. The second problem that was raised when reading the part related to problem solving is the role and benefits of varied practices in learning or interleaving effect. Mixed practices or interleaving is better than focusing on the same material or skill for extended period. If students are given the same kind of questions like in mathematics, students will not make effort to determine the necessary

strategy. Transfer is what learning is all about. Carey (2014) states that varied activities or practices are more effective than the focused kind. The varied practices force us to internalize the general rules of motor adjustment that apply to any hittable target. He further indicates that varied practices, not just repetitive practices, and works best in the long run for both motor and verbal learning. Interleaving is a useful form of varied practice: the mixing of items, skills, or concepts during practice over the longer term, seems to help us not only see the distinctions between them but also to achieve the clearer grasp of each one individually. The hardest part is abandoning our primal faith in repetition. The interleaving means mixing related but distinct material during the study. Varied practices in a lesson enhance the performance. Interleaving prepares the brain for unexpected and life's curveballs in general. This has raised my great concern of what specific strategies or tips that a teacher can follow in order to effectively implement varied practices in learning or interleaving effect. What long term benefits of varied practices in learning or interleaving effect to the students' learning?

H. Perceptual Discrimination Theory

Perceptual discrimination is defined as "*the process of how brain learns to detect minute differences in sights, sounds, or textures*" (Carey, 2014, p.180). Gibson's (1969) explained that Perceptual discrimination in learning entails an increased ability to extract relevant information from a stimulus array as the result of experience. Perceptual discrimination in learning is an increased ability to detect information specifying affordances, events, and distinctive features. In Gibson's (1992) view, "*perceptual learning is first and foremost a process of selection*" (p. 217). Perceptual information becomes increasingly differentiated and specific to the self, the world, and the relations between them.

Gibson's (1969) theoretical position, a *perceptual differentiation theory*, is that perceptual learning is learning to extract information out of the sensory data of the environment. The environment is seen as supplying an abundance of information. To make sense of the sensory input a person must learn how to respond to distinctive features of the stimuli. Perceptual learning, then, according to Gibson, has two components: First, the person must learn what the distinctive features are. Second, the person must learn how to use the distinctive features to discriminate different relevant objects.

Carey (2014) mentioned that brain perceives to learn. It takes the differences detected between similar looking notes or letters or figures and uses those to help interpret new.

As a teacher of language, I found the implication of perceptual discrimination in my lessons when I teach phonetic and phonology specifically minimal pairs. I have to deal with various distinctive features. Minimal pair is a pair of words, differing only sound in the same position in each word, especially when such a pair is taken as evidence for the existence of a phonemic contrast between the two sounds. It is a set of minimally contrasting words like /pɪn/ vs /bɪn/ vs /tɪn/ vs /dɪn/ vs /kɪn/. When teaching minimal pairs, I emphasize distinctive features, for example, through the use of clearly contrasting examples. Students learn to discriminate among the different sounds.

Additionally, I help the students to identify some of the distinctive features; for example, pointing out cues for the student to discriminate between sounds. Then through the systematic use of contrasting examples the students would be given practice using the distinctive features to make the required discriminations. This has really pushed me to ask myself how best and when I can also teach literature materials and classes basing on perceptual discrimination theory. In short, the potential is three-fold. Firstly, students learn better when I use examples which show differences and contrasts. Secondly, students use senses for discrimination learning and detecting minute differences between sounds in phonetics and phonology. Lastly, the brain provides meaning by establishing connections between stimuli and responses. Students learn better when the associates similar or previous learned objects.

I. Studying and Testing Theory

Testing is part of learning process. Teachers' use testing strategies for different purpose namely grading, checking the level of understanding and achievement of lesson objectives, promotion, and repetition. Carey (2014) recommended that the use of test should be a study technique not just for only measurement instrument. Therefore, teachers could have the responsibilities of organizing tests in their teaching as an instrument for learning improvement. Roediger et al. (2001) stated that Testing in schools is usually thought to serve only the purpose of evaluating students and assigning them grades. However, the main focus of testing that occurs in the classroom can be viewed as part of the course or self-testing that students may use themselves as a study strategy for improving performance. It was further emphasized that testing one's memory enhances long-term retention (Glover, 1989). This indicates that testing can be the best strategy to increase students' retention.

In my school, testing is part of our leaning activities. Both summative and formative testing are purposively implemented in classrooms. For formative assessment, the teacher is supposed to conduct the assessment before, during, and after teaching a particular lesson for measuring the attainment of objectives, checking understanding and retention. On the other hand, summative assessment is done after a specific period of time during learning process like the examination conducted at the end of the term, completion of the ordinary level, and advanced level for obtaining a senior six certificate.

Some useful recommendations are made to my school administration in order to change and improve the testing procedures' efficiency, strategies and results. The major recommendations are as follows: testing is a constant part of studying not only instruments for promotion and measurement purposes, the revision time and breaks are likely to be increased for students, the students should be explained about how to facilitate and enhance good study habits, the study environment for test should be conducive, the formative assessment should use various retention strategies, downsizing overpopulated classroom, standard questions for both objective and open-ended questions should be used, marking should not take long and quick feedback should be provided to students for improvement and restudying.

The school administrator should take responsibilities for informing teachers that *testing is part of studying*. Testing is part of studying not only for promotion and measurement purposes. The school administrator is invited to change the purpose of testing in classrooms. The current situation is that the test is organized for measurement and categorization of students. Roediger et al. (2001) stated that the act of retrieving when taking a test makes the tested material more memorable, either relative to no activity or compared to restudying the material. Continuous assessment should be strengthened in classrooms for formative purpose and emphasize that students' retention.

Time for revision needs to be increased. Sometimes students' needs enough time for revision. Most of the time, students' time for revision is not considered to be likely enough. There is a time when students must sit for three tests per day. Carey (2014) mentioned that frequent study breaks are more effective for learning and retention. He further explains the distributive learning or spacing out the learning has a long-term effect on learning and retention. The communication between administration and teachers should be improved to avoid overloading our students and increase their time of revision.

Good study habits guidance sessions are recommended to school administrators. The students should be explained and guided on how to facilitate good study habits. The school administration should regularly organize good study habits guidance for students. Students needs to be taught how, when, what, why to learn in order to succeed in the tests. Effective preparation matters a lot for students' success and improvement. Carey (2014) recommended some good study habits. The study habits should be consistent form day 1 to the final testing. Breaks are very important for self-study and students should avoid distractions during revision time. Additionally, the school should ensure that the learning environment for students is conducive without distractions, noise, sounds, and any other kind of disturbance. Students' time for retention is increased, when students are a conducive learning environment.

Testing and marking habits need to be improved. Some teachers take a lot of time for making and giving feedback to students. This can hinder the real purpose of testing which is studying. The school administration should make sure that tests are timely marked, and feedbacks are timely give to students for facilitating improvement and learning process. Carey (2014) recommended that the use of test should be a study technique not just for only measurement instrument. Students will improve once feedback is given to them. The opportunity for repeated study, learners may use a test as feedback in order to make better use of subsequent study sessions (Thompson, Wenger, & Bartling, 1978).The feedback will give opportunity to teachers for re-teach what is not well understood and students will take time to re-learn what is not fully retained.

Downsizing the class population should be also considered for improvement of testing strategies. Student-Teacher ratio is too high. The teacher takes care of 50 students in classroom. This can constitute the barrier to the testing habits. Teachers are overloaded with work and students' work to mark. This cannot help teachers in terms

of marking. Teachers take time for marking due to the high number of students to mark. The feedback is not timely given to students for improvement. The reduction of teaching workload for providing enough time for marking is also recommended. The teaching workload is too huge for teachers. The teachers are over loaded with teaching. Little time is provided for marking. Lastly, proof reading of question papers is recommended to minimize typing errors and insure standard of testing. Some teachers set substandard examinations with grammatical errors and without clear instructions. This can mislead students' comprehension in the examination.

J. The Power of Forgetting: The Theory of disuse

The Power of Forgetting: A New Theory of Learning. Carey (2014) states that forgetting is part of the process that leads to remembering things in the long run. Learning is focused forgetting. Forgetting creates a room for new updated information. *The theory of disuse* states that learned information without continued use, decays from memory entirely. Additionally, Carey says that memory can improve for information nested in stories or poetry. Reminiscence is also strong for visual information. Memories have retrieval and storage strengths. Storage strength can increase, but never decreases. Retrieval is fickle. It can build and weaken quickly. The theory is that no memory is lost, it is currently not accessible due to lack of retrieval strengths. To increase the retrieval strengths, information must be reinforced. A certain amount of forgetting also stimulates us to study again in order to strengthen the information we had begun to forget and much of associated information as well.

3. Conclusion and Recommendations

1) *Memory is a well-organized Machine.* Memory is composed of systematic structures. Neisser (1967), one of the most influential researchers in cognition, defines memory as the structure of how people encode, structure, store, retrieve, use or otherwise learn knowledge. The memory has subdivisions with specialized functions. This provides guidance on how teaching activities should be systematically organized. Lesson plans and delivery should follow systematically organized steps of a lesson: introduction, body, and evaluation. The curriculum should be taught in sequences considering the prerequisite of the previous lesson that is needed before teaching new concepts.

2) *Memories have retrieval and storage strengths.* Storage strength can increase, but never decreases. To increase the retrieval strengths, information must be reinforced. Basing on the important role of reinforcement for strengthening the storage, teachers should use reinforcement activities in teaching like association of similar ideas, visual support, graphics, figures, diagrams, pictures, and videos.

3) *Consider different levels and stages of students in learning.* Lutz and Huitt (2003) state that structuring and organizing information occur as the learner processes and stores information. The learner's ability changes over time as a result of both maturation and experience. One of the most important information processing

capacities a child develops is the ability to organize information. This is, in turn, influenced by the child's ability to categorize. As is the case with other information-processing capacities, this ability changes with both maturation and experience. One of the basic types of categorization is the grouping of specific events, ideas, people, and things into concepts. The level and stages of students are different. Students' levels and stages should be considered when preparing and delivering lessons in terms of content, strategies, and teaching materials.

4) *Regular recapitulative and continuous assessment test in my classrooms*. The theory of disuse states that learned information without continued use, decays from memory entirely. This provides me the opportunity for organizing regular recapitulative and continuous assessment test in my classrooms to reinforce the memory storage capacity of what I teach.

5) *Using several reinforcement activities*. The students in my classroom are different in terms of storage and retrieval capacity. We have quick and slow learners. To our students, we have learnt that storage strength can increase, but never decreases. Retrieval is fickle. This shows that all students in the classroom have the storage capacity, but they have different retrieval capacity. We need to reinforce their retrieval capacity using several reinforcement activities for insuring the best storage like exercises, figures, pictures, images, and diagrammes.

6) *Testing and Marking*. Testing is a constant part of studying. It is not only instruments for promotion and measurement purposes, the revision time and breaks. Both summative and formative testing are purposively implemented in classrooms. For formative assessment, the teacher is supposed to conduct the assessment before, during, and after teaching a lesson for measuring the attainment of objectives, checking understanding and retention. *Marking* should not take long, and quick feedback should be provided to students for motivation, improvement and restudying.

7) *Family involvement in school activities*. Above mentioned. Studies have further demonstrated a correlation between parent involvement and children's educational development and subsequent intrinsic academic motivation. There is a huge responsibility to continue collaborating with parents and reminding them their supportive role in the provision and creation of home stimulating environments towards academic success of their children.

8) *Games influence learning*. Game-based learning closely connects the classroom activities to the real life. It positively impacts on the students' learning experiences. It influences learning experiences in a sense that it provides challenging opportunity to students, repetition, and the rehearsal opportunity. The games are kinds of reinforcement activities. Games shape the memory. The concept has become increasingly popular in education to engage and motivate students in learning.

9) *Social interactions in Learning*. Vygotsky's social development theory of learning emphasized that students as people are constructed by interacting with other people. Without interacting with more knowledgeable others they may not

succeed in their learning settings. Through intensive and systematic organized debates, presentations in classrooms, role plays, and group discussions, students interact and share experiences in learning.

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Mr. Harerimana Jean Paul is trained to be a Primary and Secondary school Language teacher. He is also trained to be a school and Educational manager as well as inclusive educational Lecturer. He worked as a Professional Teacher, Lecturer, Head of Department, Dean of School of Education in Mount Kenya University; Dean of Academics in Mahatma Gandhi University, and Educational Consultant in British Council and VVOB (Flemish Association for Development Cooperation and Technical Assistance). He currently works in Mount Kenya University Rwanda as a Lecturer and Dean of Students. The areas of his interest, specialization, and teaching are English and French Languages, Educational Planning, Management, Leadership, Administration, Policy planning, Curriculum Development, Inclusive and Special Education.

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