

## THE INFLUENCE OF PAYING ATTENTION IN CLASSROOM ON STUDENTS' ACADEMIC ACHIEVEMENT IN TERMS OF THEIR COMPREHENSION AND RECALL ABILITY

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### Abstract

Students' attention in classroom and their academic achievement are two related variables, and they are reflected in students' comprehension and recall ability. However, most of the studies referred to comprehension and recall ability interchangeably and mainly used recall tasks to measure working memory capacity. Adding to that, to the best of my knowledge, there are not many studies that combine the three main variables, but they relate each one of attention and working memory capacity to achievement in an indirect way. Thus, this paper was conducted to investigate whether paying attention in class affect students' academic achievement in terms of their comprehension and recall ability. In order to measure the three main variables, which are comprehension, recall ability and attention, three different tests were used, and they were applied on a sample of two hundred English Education students in counseling psychology class. The comprehension test had three questions related to the previous lesson of counselling psychology class. For the recall ability, a task had three parts, each of which included lists of pictures or letters that the participants needed to recall their order, and the attention task was mainly adapted from the Stroop colour naming task. Students' performance in each of the tasks was compared with their achievement in the university; their GPA. In general, it was found that students whose GPA is higher than three did better than those with a GPA lower than three; however, the differences between the two groups were subtle.

**Keywords:** students; attention; comprehension; academic achievement; recall ability.

### 1 INTRODUCTION

Almost all teachers ask their students to pay their full attention to the lessons being explained. Teachers claim that attending to their every word would help students get a better grasp of the lessons and ideas, and that it would take them less time to revise what they have learned afterwards. Teachers normally tell their students this piece of information without knowing how valid it is, or whether it is true. As suggested by Dean (2006) "...teachers know intuitively that they need to harness attention for learning" (p.22). However, such an idea can be explained from a psychological point of view.

Braver and Barch (2002) and Gray, Chabris and Braver (2003) stated that attention plays a huge role in various cognitive operations, such as working memory, long term memory, comprehension and reasoning, and general fluid intelligence (Dean, 2006). Adding to that, attention has an important role in the learning process because it brings whatever information being discussed to consciousness, and leads to conscious processing (Styles, 1997). It has been said that when paying attention to a certain object, people become conscious of the object's attributes, and as soon as attention is shifted to something else, the object "fades from consciousness" (Laureys & Tononi, 2009, p.64). However, Cowan, Elliott and Shelton (2008) went against this idea and suggested that "not...everything being attended to is available to consciousness, or vice versa. In fact,...information being attended to is not always under the control of attentional processes, and attention can be often directed towards input that remains outside of consciousness" (p.1).

Others, such as Dean (2006) have suggested that attention is related to working memory, which is also known as short term memory. Working memory capacity is controlled by attention, and that is why it is supposed that attentional mechanisms are used to control the movement of information into working memory

(Dean, 2006). What is more, it has been stated that having greater working memory capacity means having the ability to use attention in order to avoid distraction (Engle, 2002). It has been suggested by some researchers, such as Dean (2006) that the relationship between attention control and working memory capacity is reflected in students' academic achievement in terms of their comprehension and recall ability; however, I believe the evidence is not strong enough because no direct relationship has been made between the three constructs.

## 2 LITERATURE REVIEW

### 2.1 Attention and Learning

Attention has been clearly defined by Gazzaniga, et al. (2002) as "a cognitive brain mechanism that enables one to process relevant input thoughts, or actions while ignoring irrelevant or distracting ones" (Dean, 2006, p.21). According to Schweizer (2010) there is more than one kind of attention, such as sustained attention, which needs a lot of mental effort that is continuously applied, selective attention; also known as focused attention, controlled attention, which refers to "controlled information processing", divided attention, which refers to "the ability to divide the attentional resources according to the demands of different processing tasks", and spatial attention, which refers to "the ability to locate a target appearing in an unexpected location in contrast to an expected location" (p.250-251).

Attention is a major component of learning. It has been suggested that attention aids the learning process because attending to lessons has a huge impact on students' immediate response (Kruschke, 2000). Selective attention is said to be the most significant aspect in learning because it helps students to focus only on what is important (Kruschke, 2000). However, students may be faced with many distractions that prevent them from learning effectively, such as the setting of the classroom, the school environment, noises from both inside and outside the classroom, and the teacher's voice and method of teaching. There are also some medical reasons for inattention such as ADHD, physical weaknesses that lead to inattention, and shallow breathing and oxygen deprivation (Super & Optom, 2005).

Posner and Peterson (1990) identified three subsystems of attention, which are alerting, that is defined as "achieving and maintaining an alert state," orienting or selecting, which is "selection of information from sensations, stimuli, responses, memories or thoughts," and executive control, which is responsible for "resolving conflict among responses as well as prioritizing among responses" (Dean, 2006, p.24). Fan et al. suggested that each of these types is independent from one another because each one serves different attention functions (Engle & Redick, 2006). From these three subsystems, executive control, also known as executive attention, and central executive, seems to be the most important subsystem in explaining the nature of the relationship between attention and comprehension in the learning process.

### 2.2 Executive Attention

Executive attention can be measured using the Stroop color naming task (Baars & Gage, 2010; Engle, 2002), which requires the important role of working memory (Engle, 2002). In this task, participants are asked to read a list of words printed in different colors and are said to be "congruent" or "incongruent" (Engle, 2002, p.22). For example, if the word "red" is printed in red, then it is said to be congruent, while if it was printed in another color, such as blue, it is said to be incongruent. The Stroop task mainly depends on "executive attention to maintain the goal of naming the color of the letters even when the word elicits a stronger response tendency to say the word" (Engle, 2002, p.22). The time that subjects spend in reading the list of words or naming the print colors will indicate their attentional capacity because the mismatch between ink colors and words causes interference, and leads to making inappropriate responses (Baars & Gage, 2010). For example, it has been found that "naming the colors of incompatible color words showed dramatic interference" and took subjects longer time to achieve the task (Baars & Gage, 2010, p.273).

Since the attentional capacity of the central executive differs from one person to another, their comprehension varies among them as well. For example, a study that was conducted by Oakhill et al. (1986) tested the comprehension of two groups of seven and eight year olds using a reading task (Baddeley, 1998). In this task, Oakhill started by testing children's memory, and then assessing their comprehension by "literal recall of information, and by recall of information that had to be derived from the passage by inference" (Baddeley, 1998, p.98). It was found that poor comprehenders scored worse than subjects with higher comprehension. However, when the text was provided for the subjects while answering the questions, both groups did well in both literal recall and inference of information, but still, the low comprehension group members made a couple of mistakes in the inference questions (Baddeley, 1998).

Oakhill's experiment did not stop there, as she went on in testing the two groups by using a task based on a modified version of Daneman and Carpenter's working memory span task in order to measure their recall ability (Baddeley, 1998). The task required the children to read a group of sentences that are made of three

numbers, and then to recall those numbers. It was found that subjects of the high comprehension group had better working memory capacity, and this difference increased as "the number of digit groups became greater" (Baddeley, 1998, p. 101).

### 2.3 Working Memory and Executive Attention

Working memory is defined by Fabiani and Wee (2001) as the "system for temporarily holding and manipulating information for performance of a wide variety of tasks including learning and comprehension, planning and maintaining goals and action, and monitoring and supervising one's own behavior" (Dean, 2006, p.27). Working memory types depend on the tasks being performed, for example when talking about thinking, then the working memory being referred to is the "thinking working memory," and there are "visual working memory" and "verbal working memory" (Baars & Gage, 2010). This system keeps information retrievable even if there is interfering information which may lead to inappropriate responses (Engle, 2002).

Interference with the retrieval of information may be caused by dual performance, i.e. working on two different activities at the same time (Baddeley, 1998). For example, when a group of pianists were asked to play the piano by sight-reading and at the same time to listen and repeat or "shadow" a piece of prose, they were not able to combine between the two separate activities, and it was explained that this happened due to the limitation in working memory capacity (Baddeley, 1998). Examples of such capacity limits can be noticed when one is presented with an ambiguous stimulus to which a subject may perceive only one interpretation, which may affect the subject's comprehension as well (Baars & Gage, 2010). As can be noticed in classroom settings, students are expected to listen to the teacher, take notes and participate in the class. Having to do all of this at once may be the cause of students' inability to focus on what the teacher is saying because they are trying to take notes, or to miss the chance to write their notes in order to listen to what the teacher is saying and to prepare themselves to answer the questions of the teacher. This definitely happens due to limitations in the working memory capacity to process too much of information at once.

Some researchers have associated working memory capacity with executive attention, and said that working memory "is often used to provide a perspective or other functions..., including mental imagery, language, inner speech, and executive control" (Baars & Gage, 2010, p.44). Adding to that, Baddeley (1998) suggested that the central executive can be explained by testing comprehension and that it is a "component of working memory" (p.101). On the contrary, some researchers, such as Engle (2002) suggested that they are the same thing. In his paper, "Working Memory Capacity as Executive Attention", Engle stated that working memory capacity "represents a domain-free limitation in ability to control attention" (p.19). It could be argued against Engle's idea that when people speak, they do it without any conscious effort to the language they are producing because they have reached the level of automaticity in using language, but it doesn't mean that the working memory is not processing information. That is why attention and working memory should not be considered as one thing, but rather as two constructs that complement each other.

### 2.4 Working Memory, Attention, Comprehension and Recall Ability and Their Relation to Academic Achievement

Both comprehension and recall ability have been used as indicators of working memory capacity. Engle and his colleagues (2002) measured working memory capacity using three tests; the reading-span task, the operation-span task, and the counting-span task. Each of these tasks measures the recall ability of the participants by trying to determine the relationship between working memory capacity and higher-order cognition. The results of the three tests were generally the same and the researchers concluded that subjects with low working memory capacity showed greater loss of recall. Baddeley (1998) suggested that the more the practice individuals get, the better the results will be because they will reach the level of automaticity, which "allows a relatively automatic output with little or no attentional capacity required for processing" (p.88).

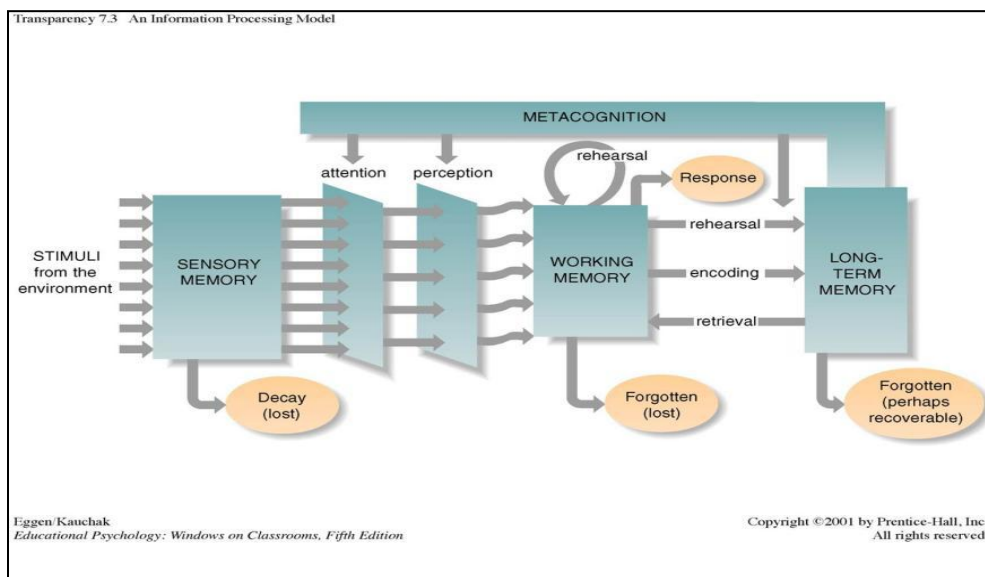
Another method that is widely used to measure working memory capacity is through the speed of reaction time (Baars & Gage, 2010). An example of a task that is used for this purpose is the Delayed Match To Sample (DMTS). In this task, subjects are supposed to make a response as soon as they see something that matches something else that they have seen recently (Baars & Gage, 2010). However, this test, as well as the ones that were used by Oakhill (1986) and Engle (2002) associate working memory capacity with the ability to recall only, ignoring the other tasks in which working memory plays an important role such as "comprehension, planning and maintaining goals and action, and monitoring and supervising one's own behavior" (Dean, 2006, p. 27). Focusing on just one aspect when measuring working memory capacity reduces the validity of the results of the working memory capacity tasks.

Working memory capacity plays an important role in students' attention span, comprehension and recall ability to the lessons, which may affect their academic achievement. The relationship between working

memory capacity test results can be connected to students' achievement in their school work in order to make the relationship between the two constructs (Dean, 2006). For example, Gathercole (2003) tested 55 eleven year olds and 73 fourteen year olds and found a relationship between their national curriculum test scores in mathematics, English and science, and their working memory test results. A weakness that was found in working memory tests was that rather than highlighting how well subjects are "able to select and maintain relevant information in the presence of distractions," they focused on "how much information the [subjects are] able to process and recall" (Dean, 2006, p.34). Braver and Barch (2002), and Gray, Chabris and Braver (2003) suggested, as well, that both attention and working memory capacity are related to general fluid intelligence even though it is mainly affected by neurological basis (Dean, 2006).

## 2.5 Improving Working Memory and Attention Span

Both attention span and working memory capacity can be improved through training, although working memory capacity have been thought of being constant in the past (Dean, 2006). Training working memory have shown that certain areas in the brain became more active, which lead scientists to believe that such training affects the functioning of the nervous system (Dean, 2006). It could be said that in a classroom setting, when teachers ask their students to pay their attention in class, students are being trained to control their attention, and thus, to control the information processing. According to the information processing model (2001), students need to rehearse the information while processing in the working memory in order to be stored in long term memory and then retrieved successfully afterwards. Distractors in the classroom may prevent processing from happening, and that's why students need to be trained to exclude and avoid attending to such distractors (see the figure below).



Information Processing Model (Moos, n.d.)

## 3 METHODS

### 3.1 Participants

The participants (N=200) in this study, 190 females and 10 males, were all education English major students. There were in their third, fourth and fifth year, and they were enrolled in a counseling psychology course in which they met twice a week.

### 3.2 Instrument

Three tasks were used in the current study. The first task aimed at measuring students' comprehension in the counseling course, the second aimed at measuring their recall ability, and the third aimed at measuring their attention span. The tasks were selected and adapted from previous research done in the same area of the current research.

*The comprehension task* included three questions related to what students have learned in their counseling psychology class. Each question had three choices from which the students selected only one correct answer.



*The recall ability task* was conducted using a computer. This task included three sub-tasks; the first two aimed at measuring the visual working memory by presenting visuals in a series of slides over specific time periods, and the third one aimed at measuring the verbal working memory by presenting a series of jumbled letters. The first one, which was adapted from Baars and Gage (2010), included a sequence of seven slides, each of which had one square and one circle, but in each slide the circles and squares were in different positions. Each slide was shown for only three seconds before moving to the next one. At the end, three different lists of sequences were provided for the participants in the computer, and the students had to choose the one they thought represented the sequence they were shown on the answer sheet (for more clarification on the answer sheet). The second one included eight pictures of different animals, and as the first task, each of the pictures was shown for only three seconds. At the end, three lists of different sequences were provided and participants had to select the one they thought to be correct on their answer sheet. The third task included seven letters of the English alphabet, each presented in a slide, and at the end, three lists of different sequences were provided and students had to choose the one they thought represented the sequence they saw.

*The Stroop color naming task* was adapted from Baars and Gage (2010) and had four parts. This task was mainly used to measure students' executive attention. The first part included eight words of different colors which were printed in black. The second part included ten words of different colors which were printed in different colors; the participants had to read the words ignoring the color in which they were printed. The names of the colors and their print color did not match, in other words, they were incongruent. The third part included a list of ten items with letters written in different colors. The participants were asked to name the colors with which the letters are written. The last part included a list of ten names of colors which were printed in different colors. The participants were required to name the color of the words rather than reading them.

### 3.3 Procedures

The intact class was purposely selected because I needed to relate the current research to a specific class in which all participants would be in similar circumstances which can be controlled. All students were in the same class room at the same time, and they all started working on the tasks at the same time, and spent the same amount of time on doing the tasks. They were all monitored while they were working on the tasks. Also, I wanted to relate the findings of this research to a specific course, and in this case, it is the counseling psychology course. Each of the participants was provided with an answer sheet that included three parts; one for the comprehension task, the second for the recall ability task, and the third for the Stroop color naming task to measure executive attention. The three tasks were completed during the last thirty minutes of the regular class time. The instructor explained the lesson at the beginning of the class, and the three comprehension questions were based on that lesson.

The first task the students completed was the comprehension task. Students were asked to answer the three questions individually in three minutes. The second task the participants did was the recall ability task which included three sub-tasks, and participants were shown some visuals in a series of slides; each of them was presented for only three seconds. After each of the sub-tasks, the participants were asked to choose one list that represented the sequence they were shown. The third and last task the participants did was the Stroop color naming task, which aimed at measuring executive attention. This task was done with each of the participants individually with the help of three of my colleagues. This task included four pages, each of which had a list of color names either in black or colored, and the participants were asked to either read each of the words in the lists or name their colors. If they read any of the words incorrectly, they had to read it again. The students were asked to follow the instructions in each page while my colleagues and I wrote down the time they spent reading each list. Each student did not take more than two minutes, and the whole task took approximately from fifteen to twenty minutes.

### 3.4 Data Analysis

In order to analyze the collected data, an Excel spread sheet was created. The sheet had three parts, each of which represented a part of the participants' answer sheet. There were originally twenty six samples, but six of them were excluded because they did not include the students' GPA, and as a result, the twenty remaining samples were used. The first three columns on the left included participants' numbers, which were from one to twenty, followed by their gender, and then, their GPA. The GPA had a code of either one, which indicated a GPA lower than three, or two, which indicated a GPA higher than three.

For the comprehension part, each of the three comprehension questions had a list. The answers had two codes; while one indicated the correct answer, two indicated the incorrect answer. However, three of the

participants did not provide an answer to the third question, so the code zero was used. A table was created, which included the total of correct and incorrect answers for each question, and then they were divided into four parts; total correct for high achievers, total incorrect for high achievers, total correct for low achievers, and total incorrect for low achievers.

The recall ability part had the same structure, with three lists one for each question, and the same codes were used for correct and incorrect answers. At the end, a table similar to the one done for the comprehension part was made with the total of correct and incorrect answers for both high and low achievers and then totals of each group was calculated separately.

The attention part, however, had a different structure because the performance of the participants mainly depended on the time they spent on reading the lists rather than whether their reading of the words was right or wrong. The average of all participants in each of the four tasks was calculated, and then a two codes were provided to see whether the participants' time spent on reading the lists was more than the average; one, or less than the average; two. Time higher than the average in this case referred to lower attention span, and time less than the average referred to higher attention span. A table at the end of the list was made to compare between high achievers and low achievers' attention spans.

## 4 RESULTS

### 4.1 Comprehension

Table 1. The frequencies of students' answers for questions one, two and three regarding their comprehension

		Q1	Q2	Q3	Total
All Students	Correct	100	200	70	370
	Incorrect	100	0	100	200
High achievers	Correct	70	110	50	230
	Incorrect	40	0	50	90
Low achievers	Correct	30	90	20	140
	Incorrect	60	0	50	110

As can be seen in table one, the performance of high achievers in in both questions one and three was better than the performance of low achievers. However, all students in the high and the low achieving groups answered the second question correctly. This may be due to the fact that this question was easier than the other two questions.

### 4.2 Recall Ability

Table 2. The frequencies of students' answers for questions one, two and three regarding their recall ability

		Q1	Q2	Q3	Total
All Students	Correct	140	110	190	440
	Incorrect	60	90	10	160
High achievers	Correct	80	80	100	260
	Incorrect	30	30	10	70
Low achievers	Correct	60	30	90	180
	Incorrect	30	60	0	90

As it is shown in table two, higher achievers' recall ability is better than low achievers' in both questions one and two. However, all low achievers answered question three correctly, and only one of the high achievers answered incorrectly.

### 4.3 Attention

Table 3. The frequencies of time students spent in doing the Stroop color naming task in order to measure their executive attention

		Q1	Q2	Q3	Q4	Total
High achievers	less than average	60	40	50	50	200
	more than average	50	70	60	60	240
Low achievers	less than average	60	10	60	40	170
	more than average	30	80	30	50	190

According to table three above, higher achievers generally spent less time than average in doing the Stroop color naming task than low achievers. However, in the third part of the task, which required the participants to only name the colors in which the list of letters were written, low achievers performed better than high achievers as they spent less time than average in doing that part of the task. This can be attributed to the fact that this part demanded less mental processing than the other parts of the task, which either required them to read the words and ignore their color, or to name the colors of the words and not to read them. It could be, as well, suggested that the low achievers are visual learners who find it easier to interpret a visual based stimulus rather than a literal based one.

## 5 DISCUSSION AND INTERPERTATION

As can be seen in the tables above, students with grades higher than three performed better than low achievers in most of the tasks. However, some of the low achieving students' performance was as good as high achievers', or even better, and the differences among them in some of the tasks, such as in the correct answers to the third question of the recall ability task, which is clear in table (2), and in both more and less than average results in the fourth question in the attention task, which is found in table (3), were subtle. This can be attributed to the small sample size. Regarding the fact that low achievers were better than high achievers in some tasks, as in the third question of the recall ability task to which all low achievers answered correctly (see table 2 above), it may be said that students' verbal working memory is better than their visual working memory since this question required them to recall a series of letters. Also, it could be said that they made a word from the letters that were provided; QZRCPD, which made it easier for them to remember their sequence.

The performance of the students in the three tasks might be affected by several reasons. Firstly, the time of the class was from four in the afternoon to six in the evening, and some of the students have teaching practice, so they might have been tired, which negatively affected their performance in the different tasks. Secondly, the students were seated in the class room next to each other and some of them were talking during the tasks, which may have caused some noise to other students. Thirdly, as the attention task is concerned, students' performance might be affected because they were told that they will be timed, so they might have read the lists of words faster.

## 6 RECOMMINDATIONS

### 6.1 For Further Research

For the future, it is recommended that the sample be selected after knowing the GPAs of the students in order to have an equal number of high and low achievers, so that the differences between them will be clear, and making comparisons between them will be easier. In order to achieve this, classroom observations could be made before selecting the sample, so that those who pay attention in class and those who do not well be separated right from the beginning, and accordingly, their attention will be tested and compared to their academic performance in a specific course and in the university as a whole; their GPAs. Selecting a larger sample which includes an equal number of male and female students is also highly recommended in order to have clear differences between the two groups. It could also be suggested that the sample include students from colleges of human sciences and colleges of science because I believe that colleges of science's course require students' attention in class and more mental effort than the colleges that teach human sciences' courses, which mainly depend on rout memory rather than understanding.

## 6.2 For Teachers

Teachers need to take into consideration variations among their students; some can be attentive for a longer period of time than their other peers, and this is due to the differences in their attention spans. Also, some of them are more visual than others, so it would be helpful if teachers associated the new information with some pictures in order to facilitate the learning process, and make it easier for students to recall them when needed, especially in tests and quizzes. It is the teacher's duty to arouse students' interests in the subject they are teaching because it is known that students stop paying attention in class when the topics or the teachers are boring; therefore, involving students in the teaching/learning process as much as possible is highly recommended so that teachers do not lose their students in the classroom. Teachers, as well, need to investigate the reasons behind students' inability to pay attention in class; whether those reasons are medical or non-medical, and try to work on possible solutions for them. If teachers are able to achieve all these recommendations, they will definitely help students improve their academic performance.

## 6.3 For Students

For students' best interest, it could be suggested that they pay their full attention in class since the results of this study have shown that students with higher GPAs are the ones who have better comprehension, recall ability and attention span. Paying attention in class definitely facilitates the learning process for the students because the information will be processed effectively which makes their retrieval easier later. Making mind maps, tables, graphs and abbreviations for lists of words when revising for exams makes it easier to remember the information because, as seen from the results of the recall ability task, high and low achievers' results in the recall ability task, which mainly depended on visual, were close and hardly any difference could be detected. In the classroom, students are recommended to avoid distractors from both inside and outside the classroom, such as noise, side talks with classmates and people passing by the classroom. Although doing this might seem as an easy thing to do, some students struggle with this problem. Training oneself to ignore such distractors that might lead to inattention in classroom is very important in order to not affect the processing of the new information in a negative way because it will definitely make it difficult to comprehend what the teacher is saying.

## 6.4 For Schools (teachers and principals), Curriculum Designers and Ministry of Education

Schools may contribute to students' ability to pay attention in the classroom. For example, teachers and principals could make some weekly workshops to discuss the reasons behind students' inattention in classroom and provide some solutions for each of the problems, and in fact, they can involve the parents of the students in this process because they are aware of their children's problems. They might consider the physical and psychological atmosphere in the classroom. The physical atmosphere is mainly concerned with the seating of the students in the classroom; individually, in pairs or in groups. Some students lose their attention immediately when they sit next to their friends in classroom because they will start to discuss issues regarding other things that happened to them outside the classroom rather than discussing what the teacher is talking about. The physical atmosphere also includes the temperature of the classroom. Students cannot focus when the temperature is either too cold or too hot, and that is why making sure that the temperature is moderate is crucial.

The psychological atmosphere includes both students' and teachers' feelings in the classroom, as well as their attitudes towards the subject on which they are working. Teachers need to appear pleasant and confident in front of the students so that students would feel encouraged to be engaged with both the teacher and the lesson being explained. Students' involvement in the classroom is an indicator that they are being attentive in class. The attitudes of the students towards the subjects they are learning will affect their interest in them, which in turn affects their attention. The seating of the classroom also affects students' mood in the classroom. If the teacher asks the students to work only in groups without giving them the chance to work in pairs or individually in order to have the chance to get a better grasp of the lesson and work on their own pace, students will get bored easily because the activities are done in a monotonous way.

Curriculum designers can make books more appealing to students in order to arouse students' interest in the subject matter, which will boost students' intrinsic motivation level and make them more eager to learn the subjects, and they enjoy the learning process and will try to be involved in it. The ministry of education can collaborate with curriculum designers with different ideas in order to design books that serve the curriculum purposes, but at the same time are interesting to students in order to ensure that students are interested enough in the subject to the extent that they will pay their full attention in class. The ministry as well could



hire specialists to go to schools and provide guidance for both teachers and students about the importance of attention in the learning process and how it affects the academic achievement of the students. They can also teach teachers some strategies that would help them to maintain students' alertness in classroom, and teach students some strategies which help to be attentive for a longer period of time.

## 7 CONCLUSION

Attention is clearly an important factor that contributes to learning because it facilitates information processing and has a huge impact on students' immediate response in classroom. There are many types of attention, such as sustained attention, selective attention, controlled attention, controlled attention, divided attention and spatial attention. Each of these types is required in different situations, depending on the types of tasks that teachers provide for students. There are also three subsystems of attention: alerting, orienting or selecting and executive control, which is considered to be important in clarifying the nature of the relationship between attention and comprehension. It is said that working memory capacity is related to students' learning, which depends on their comprehension, recall ability and attention span. If students' working memory has the ability to process the received information in class effectively, they will have better understanding, and they will be able to retrieve the information effectively when needed because the process of learning has been facilitated by their attention. This will definitely affect their academic performance of the students positively. Although variations among students cannot be ignored because there are some students who have higher working memory processing than others, some suggested that training can improve both attention span and working memory capacity. Training oneself to pay attention in class helps to reach the level of automaticity which makes it easier for students to be attentive for a longer period of time.

## REFERENCE LIST

- Baars, B., & Gage, N. (2010). *Cognition, brain, and consciousness: Introduction to cognitive neuroscience*. California: Elsevier Ltd. Retrieved on the 23rd of February, 2013, from <http://www.brainm.com/software/pubs/brain/Cognition,%20Brain,%20&%20Consciousness,%202nd%20Ed.pdf>
- Baddeley, A. (1998). *Human memory: Theory and practice*. USA: Allyn and Bacon.
- Cowan, N., Elliott, E., & Shelton, J. (2008). Attention and working memory: Tools for understanding consciousness. Retrieved on the 26th of January, 2013, from <http://www.theassc.org/files/assc/2261.pdf>
- Dean, S. (2006). *Understanding an achievement gap: Exploring the relationship between attention, working memory and academic achievement* (Doctoral dissertation). Retrieved on the 14th of March, 2013, from <http://search.proquest.com/docview/305258182>
- Engle, R. (2002). Working memory as executive attention. *American Psychological Society*, 11 (1), 19-23. Retrieved on the 18th of March, 2013, from <http://www2.psych.ubc.ca/~pgraf/Psy583Readings/Engle%202002.pdf>
- Engle, R., & Redick, T. (2006). *Working memory capacity and attention network test performance*. *Applied Cognitive Psychology*, 20, 713-721. Retrieved on the 18th of March, 2013, from <http://psychology.gatech.edu/renglelab/publications/2006/Working%20memory%20capacit%20and%20attention%20network%20test%20performance.pdf>
- Kruschke, J. (2000). Learning involves attention. *Connectionist Models in Cognitive Psychology*. Retrieved on the 2nd of February, 2013, from [http://www.indiana.edu/~kruschke/articles/attn\\_chapter.pdf](http://www.indiana.edu/~kruschke/articles/attn_chapter.pdf)
- Laurey, S., & Tononi, G. (2009). *The neurology of consciousness: Cognitive neuroscience and neuropathology*. London, UK: Elsevier Ltd. Retrieved on the 29th of November, 2012, from [www.ebook-share.net](http://www.ebook-share.net)
- Moos, D. (nd). Information processing theory in context. *Educational psychology*. Retrieved on the 7th of May, 2013, from [http://homepages.gac.edu/~dmoos/documents/IPT\\_000.pdf](http://homepages.gac.edu/~dmoos/documents/IPT_000.pdf)
- Schweizer, K. (2010). The relationship of attention and intelligence. *Handbook of Individual Differences in Cognition*, p. 247-259. Retrieved on the 9th of February, 2013, from [http://download.springer.com/static/pdf/379/chp%253A10.1007%252F978-1-4419-1210-715.pdf?auth66=1360761945\\_04aa73362e7\\_da3e2d9409d9d5e142\\_942&ext=.pdf](http://download.springer.com/static/pdf/379/chp%253A10.1007%252F978-1-4419-1210-715.pdf?auth66=1360761945_04aa73362e7_da3e2d9409d9d5e142_942&ext=.pdf)

- Styles, E. (1997). *The psychology of attention*. UK: Psychology Press Ltd. Retrieved on the 2nd of February, 2013, from <http://www.arseba.org/Library/Psychology%20Complete/Research-Psychology/Cognitive%20psychology/THE%20PSYCHOLOGY%20OF%20ATTENTION%20-%20Elizabeth%20A%20Styles.pdf>
- Super, S., & Optom, D. (2005). Medical and nonmedical causes for inattention and attention deficits. Retrieved on the 2nd of February, 2013, from <http://professorwysuper.com/pdf/researcher/MEDICAL%20AND%20NONMEDICAL%20adhd.pdf>