Educational Techniques:

The Effects of Questioning on the Recall of Information.

Student: Helen Campbell.

Degree: BA (Hons) in Psychology.

College: National College of Ireland, Mayor Square, Co. Dublin.

Supervisor: D.R. Rebecca McGuire.

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Abstract:

The aim of this study was to identify the techniques that are effective for educators to use to help improve students' learning and academic achievement. The techniques that were investigated in this study were; whether asking questions is effective in recall of information presented rather than not asking questions (tested using One-Way Anova), what the specific type of questions are that a teacher should ask in order to receive accurate recall of the presented information (tested using One-Way Anova) and the effectiveness of re-testing (Tested using Paired Samples t-test). The experiment comprised of ninety participants (N=90), each group had thirty people in it; Open-ended questions group (N=30), Closed-ended questions group (N=30), and the Control group (N=30). Results suggest the significance of; asking questions, different question types and of re-testing.

Introduction:

Learning and memory are vastly related concepts. Learning refers to gaining knowledge or new skills (happens slowly and sometimes with difficulty), where memory refers to the actual knowledge stored (happens suddenly, - where recall comes from). (Kazdin, 2000).

Okano, Hirano, & Balaban (2000) suggest that there are various kinds of memory. ‘‘Declarative Memory’’ regards the knowledge of events and factual information and is obtainable from our conscious mind. And ‘‘Procedural Memory’’ is not obtainable from our conscious mind. It is the memory that is needed for everyday living. For example, It would become excruciating if you had to learn how to drive a car every morning however, because of ‘‘Procedural Memory’’, once you master how to do it once, it doesn’t have to be learned again, it becomes a routine. (p.1),

Craik & Lockhart (1972) developed “Levels of Processing” where they believed memory function is affected by the depth of mental processing. The simplicity of how easy it is to recall information depends on how deep the level of processing is. Deeply processed memories lasts longer e.g. (**Semantic Processing** - interpreting the meaning of a word and linking it with words that share a related meaning), whereas Shallow processed memories deteriorate easily e.g. (**Structural Processing** - based on appearance- which is when physical qualities are translated or; **Phonemic Processing** - translating the sound of a word).

For Educational Psychology, Teachers should have an extensive knowledge on, the development of a course, different coaching styles, and theories about human learning.
In Learning the most prominent theories are;
Cognitive - Mental process in learning.
Social – Group process in learning.
Humanistic – Learning that is affected by emotions.
Behaviourism – Visibly apparent learning.
The current study focuses mainly on the Cognitive learning theories, more specifically the constructivist’s approach. Cognitive psychology concentrates on mental processes, including how individuals; acquire, recall, reflect on and perceive knowledge. (Blake & Pope, 2008, p 59). One of the main initiators of the constructivist theory was Bruner (1960). He proposed that learning is an active process and found that for learning to occur a person must build new concepts taken from their existing knowledge. He suggests that it

is important for a person to understand information and personal experiences by comparing them.

Blake & Pope (2008, p 59) suggested that in order for teachers to help the development of their students and for them to achieve well in class, they must have a good understanding of cognitive psychology and buoyantly integrate Piaget's and Vygotsky's theories into their coaching techniques. Dahl (1996) agreed that both Vygotsky and Piaget addressed the development of learning in the child however, had different perspectives on how this can be achieved. Piaget believed that learning is the inactive development of associations where Vygotsky believed that learning is an active process that does not have to wait for 'readiness'. (p. 2). Both theories can be very beneficial for students'. Piaget's theory can help Teachers improve their knowledge of how their students' think. And, Vygotsky's "Zone of Proximal Development" can help a teacher offer support to the learners in order to help them complete a task. (Blake & Pope, 2008, pp 62 & 63).
Vygotsky (1978) understood that learning is not development as a whole but, rather a major part of mental development. This is essential to progress socially structured and emotional functions. (p.90) Vygotsky developed his "Zone of Proximal Development" which is a theory that discusses the different areas of school learning. It looks at the difference between what children can accomplish under supervision of adults or social interactions (potential development), and what they can accomplish by independent problem-solving (actual developmental) (Vygotsky, 1978, p. 86; Daniels, 2001). After one of these two developments is recognised, it becomes a part of the person's independent development in which the Child plays an active role in their own learning. (Vygotsky, 1978, p. 90).

Bruner (1960) discussed the nature of Vygotsky's (1978) "Zone of Proximal Development" in relations to 'scaffolding' which is the way in which children can be supported in their learning through suitable assistance from a mature adult. The effectiveness of this assistance depends on how much the 'Teacher' pushes the 'Learner' beyond their level of development. This can occur successfully if the teacher considers the language and the thinking styles they are using, i.e. ('Modelling' – feedback, tutoring, questioning, and reinforcement). On Success of this theory, Scaffolding is steadily withdrawn and the learner can swiftly move through the Zone of Proximal Development.

Robert & Brian (2014) discussed the importance of questioning as far back as ancient Greek philosophy by using the 'The Socratic Method', a common technique used by Teachers. It suggests that Teachers should ask their students' countless amount of questions and follow-up questions, and assist them to explore, discuss and contradict ideas using critical thinking, intellect, and judgment. This will facilitate the students' in finding faults in their own perceptions hence, finding solutions to come to a concrete and rational conclusion. (p. 182). Since the beginning of the Socratic Method for educational purposes, Teachers' questioning is viewed as the second most common technique for learning. The Socratic Method enables students to keep up to speed on learning, improve academically and stops absentmindedness during lessons (Cotton, 2007, p.1). "A question is any sentence which has an enquiring form or purpose". Questions are usually seen as prompts from teachers as a coaching technique that enables the student to comprehend the essential information that ought to be learned. (Cotton, 2007, p 1&2).

The Role and Importance of Questioning as a Learning Technique:

Teachers are equipped with a very important educational tool which is "Questioning"; it is a normal piece of communication which teachers have great access too. Although the quality of the actual questions a teacher asks their students is vital, it is more important that the quality of the question at hand is understood. "Questioning is vital to the way teachers manage the class, engage students with content, encourage participation and increase understanding" (Darn & Çetin, 2010). Cotton (2007) found that teaching which includes mind stimulating questioning during class is better in constructing achievement improvements in students' results than classes where teachers don't ask their students' questions. The results also indicated that the performance of students' are far better in tests when they were previously exposed to the questions before the test in opposed to not being exposed to the questions. (p.4). Cotton (2007), indicates that; Teachers' asking their students' questions during class has been an on-going and vital role of a teacher's selection of educational techniques with significant results to back up its association to student success. (p.3). Moeser (1978) proposed that unlimited amount of studies have been dedicated to examine how questions asked while a piece of information is being presented will positively affect later re-call of that particular information. The overall results of these studies show that questioning greatly improves intentional learning and often increases incidental learning as well, thus, it is argued that from a practical point of view, questioning is a valuable educational tool. (pp. 290-303). Yali (2010, p. 74) discussed how

people can learn by two different means. Incidental learning (Learning unknowingly- a form of accidental learning usually within an informal learning situation). Intentional learning (Learning deliberately- a form of goal directed learning). The studies that Moeser (1978) remarks on help give an indication of what the predicted outcome to this particular study is. She proposes that being asked questions whilst being presented the information will improve a person's later recall on that information. That is the root of what the current study grounds on.

The Current Study:

The purpose of this current research is to consider educational techniques and strategies for educators teaching their students. This study seeks to identify techniques that are effective for educators to use to help improve students' learning and academic achievement. The methods that will be researched in this study are; whether asking questions is effective in recall of information presented rather than not asking questions, the specific type of questions a teacher should ask in order to receive accurate recall of the presented information, and the effectiveness of re-testing.

Different Types of Questions.

Blosser & National Science Teachers Association (2000, p. 3) suggest that there are four main types of questions;

Managerial - questions that keep the classroom progressions active.

Rhetorical - questions that highlight a statement or support an idea.

Closed - questions that pursue recall of information that is held in memory.

Open - questions used to encourage conversation and communication amongst students.

Darn & Çetin (2010) suggested that open-ended/broad questions are paramount as, they require numerous responses and a higher level of thinking; they are also best for evolving skills such as "concluding, predicting, verifying and summarising". Closed-ended questions have more carefully distinct correct answers which can be recalled from memory and require little thinking or creativity and are common in conventional tests. This article suggests that open-ended questions are much better in the long run for students when it comes to effective learning and critical understanding but, closed-ended questions are better for students' recall of information especially when the follow up test is very close to the date when the information was given to the students.

Glass and Sinha (2013, p.471) carried out a within-student; within-item experimental design, asking students' multiple-choice questioning (MCQs), and short-answers (Open ended questions) during class, they found that asking students these types of questions enhanced the participants results in an exam. In order for them to observe the participants outcomes in detail they used (Clickers - individual response devices). Results show the significance of asking closed ended questions, (MCQs) in how it can improve recall which is similar to the present study where, one of the purposes is to test the validity of closed ended questions.
Roediger, Agarwal, McDaniel, & McDermott (2011) found that multiple-choice tests enhanced student's performance on both short-answer questions and free recall tests. Glass and Sinha (2013, p.475) highlight that if a multiple-choice question is assembled well, it can result in the recall of a substantial amount of semantic information as opposed to just definite responses. Multiple-choice questioning has been established as an effective and proficient educational technique for increasing exam performance.

In a recent study conducted by Gilson, Little, Ruegg, & Davis (2014, p. 101) they aimed to find the types of follow-up questions frequently asked by teachers and how it affected their students exam grades. Results show that the teachers asked a selection of follow-up questions (higher-level and lower-level thinking questions) and that each teacher tended to ask a greater proportion of higher-level questions to their higher-level students rather than of other students. The follow-up questions discussed may help other teachers to expand their selection of questions to ask students during class discussion. This in turn may enable students' to do independent learning and obtain a higher mark in a follow up test/exam.

Noteworthy findings from Cotton (2007) found that on the average, during class time, around 60% of the questions teachers ask students are lower cognitive questions, 20% are higher cognitive questions, and 20% are practical - applied to real-world situations. (p.5). From previous research it is clear that higher order questions enable a student to think more about the question which in turn creates a unique response, and being asked a lower order question enables the student to answer due to recognition. Cotton's (2007) findings show that a very high percentage of teachers ask lower order (closed-ended) questions which is abundant for the student in MCQ tests or short answer tests but, when a student is expected to write an essay or long paragraphs in a test, this style of teaching indicates dissipated answers from the students and negative results.

In a revision of Bloom's (1956) Taxonomy of Educational Objectives, Anderson & Krathwohl, (2001) agree that in order for higher level thinking to occur, teachers should ask more profound and challenging questions which students must create an answer or rationalise thinking with evidence, e.g. Open-Ended Questions. On the other hand, questions that require lower-level thinking are perceived as questions of fact, where students are asked to give accurate recall of something. Anderson & Krathwohl, (2001) proposed that, "Ideally, questions should be combined to; lower- order thinking-to assess students' knowledge and comprehension, with questions that require; higher-order thinking-to assess students' abilities to apply, analyse, synthesize, and evaluate". Teachers are usually also asked to avoid over-using lower-level thinking questions but, if the teacher's purpose is to assess students' basic understanding, than lower level thinking questions are suitable.

Spörrle, Gerber-Braun, & Försterling (2007) claims that what all closed-ended (MCQs) responses have in common is that the answers to the related question are already given in the questionnaire and it's merely a process of selection by the student but, it does take the administrator of the test some time and effort to ensure that all potential answers are presented, which requires prior knowledge of the topic. As opposed to closed-ended questions, open-ended questions have no answers provided only a blank space for thought, this technique is strongly preferred and is usually used when it is difficult to list all potential answers. (p. 103).

The Role of Testing in Retention.

Roediger & Karpicke, (2006, p. 249-253) conducted a study to test how to better enhance students' retention of information. In this study it is suggested that students' retention would be more enhanced if they were tested on material regularly and unannounced. By doing this the students would have a higher level of recall of material rather than if they were not tested. As can be seen in this current study, the participants who are answering 'open and closed' – ended questions are exposed to the same questions twice which should therefore enhance their results the second time around rather than, the participants who are not asked questions throughout this study but, are only exposed to the questions once at the end. Roediger & Karpicke (2006) study uses this technique of re-exposure. Their results suggest that immediate testing after exposure of material has a good effect on retention especially short-term which links in with the current study how, considering educational techniques and strategies in the classroom and, how an educator can better enhance student

learning. Re-testing can help a students' performance by using a follow-up test using both short-answer questions and multiple-choice questions.

Re-testing improves recall more than any other learning technique and this can happen without feedback. studies established that primary cued-recall testing (person given a list of things to remember, and is then tested with prompts to remember those things) improved following recall more than did re-studying (Halamish & Bjork, 2011, p. 801; Rowland, 2014, p. 1438; Duchastel, 1981, p. 218).

In Haynie's (2007) Meta-Analysis looking at the effects of test taking on retention, he found some studies that exhibited the positive effects of in-class tests on retention. Duchastel (1981) conducted a study examining the effects of three types of initial test on future retention (Multiple choice tests, Short answer test, and a full free recall test). He recognised that the testing effect anticipated that the different types of tests would affect retention, with the largest effect acquired by the group tested first with a Short answer test. This prediction was backed up by the results of the cued retention test (p. 223). Nungester & Duchastel (1982) directed a study where they had three groups of people read a piece of writing from a book, afterwards Group 1- took a test on the piece of writing, Group 2- spent equal time reviewing the piece of writing, Group 2- were undergoing a separate task (control group). Results show that in the follow-up retention test given two weeks later to all groups, Group 1-the test condition group had significantly better retention of the piece of writing rather than the other two groups (pp. 18 & 21).

Current Study:

This study involves 3 groups attending a simulated class where they are all shown a 7 minute video on the topic 'The Learning Brain' (see appendices for video link and questionnaires). To test the Hypotheses at the end of the simulated class the three groups were all given a set of questions to answer (By hand) based on the topic covered.

The three groups get the exact same 10 questions to answer at the end of the class. The three groups are 1, 2, and 3:

1. Control group (will watch the video, they will not be asked any questions throughout the simulated class time, they will only be asked the 10 questions at the end of the class based on the topic covered).

2. Open-ended questions group (will watch the video, they will be asked open ended questions throughout the simulated class. They will also be asked the 10 questions at the end of the class based on the topic covered).

3. Closed-ended questions group (will watch the video, they will be asked closed ended questions (MCQ's) throughout the simulated class. They will also be asked the 10 questions at the end of the class based on the topic covered).

Hypothesis 1: Asking questions to participants (Open-ended and closed-ended questions group) during a simulated class will result in them having a higher level of accuracy (better recall) compared to those (Control Group) who are not posed questions during the simulated class.

Hypothesis 2: Participants who are asked closed-ended questions during a simulated class will have a higher level of accuracy (better recall) compared to those who are who are asked open ended questions during the simulated class.

Hypothesis 3: Both experimental groups (Open-ended and Closed-ended questions group) will have a higher level of accuracy (better recall) in phase 2 (test at the end of the video) compared to phase 1 (test throughout the video).

In addition to the previous hypotheses, two more test will be ran to find if **(1)** There will be a significant difference between the three groups perceived level of enjoyment and difficulty. **(2)** There is a relationship between the participants' perceived enjoyment, difficulty and how accurate their answers were.

Methodology

Participants:

A total of Ninety participants (N=90) completed the questionnaire. Thirty Seven Males (N=37) and Fifty Three Females (N=53). Three groups in total, each consists of Thirty people (N=30) containing randomly mixed Males and Females in each group. The overall age of men and women range was from 18 to 63 Years (Mean=28.60, SD=10.07). Participants were of English native speaking countries. Convenience sampling was used because of the participants' suitable availability and proximity to the examiner.

Design:

The research design is a between-participants experimental design as there are two experimental groups (Open and Closed- ended questions group) and a control group. All three groups share the same Dependent Variable (Accuracy of Recall) but have different Independent Variable's (Questions, Question types, or, no Questions). This study employed a quasi-experimental (between-groups), correlational design to compare the differences of the accuracy of answers between participants who are asked questions to those who are not, to compare the differences between the accuracy of answers when being asked either closed-ended questions or open-ended questions, and to test the effective of re-testing.

Measures/Materials:

The phrasing of all the questionnaires were completed for the suitability of English speaking participants, i.e. the questions were written in English and the video was also in English. The three groups were initially given their own booklet (see appendix 2, 3, &4), which may have included their 10 questions depending on their Group. The booklet included the purpose of, and all information about the experiment. The questionnaire booklet (see appendix 5) which was written by the experimenter was given to each participant once the video had ended. The designed questionnaire consisted of 10 questions in which all participants answered once the video had ended. The questionnaire also sought after the following data: participant information (e.g. Age, Gender, Employment status, Educational status, and Highest Level of Education Achieved). It ended with a five question 7 point Likert scale which asked participants about their experience of the experiment and a question on learning through the media. The experimenter followed their own instructions with the aid of their own handbook (see appendix 1). The reliability and validity of the test was sought after the pilot study was conducted and revised. The

questionnaires were scored very basically, the examiner had a list of all the correct answers and the participants were scored as followed; (1=correct, 0=incorrect, 0.5= partially correct) note that the 'partially correct' answers only apply to the Open-ended questions Group as the other two groups had to answer in a MCQ format which required he participant to circle a right or a wrong answer, nothing in-between.

Procedure:

Pilot Study:

Before the actual experiment was conducted a pilot study was carried out to test initial comprehension of the questions being asked. The pilot study included 30 people in total. Initially 5 people were asked to answer the 10 original questions without watching the video (note, the questions were based on the contents of the video). If one person answered correctly to a question then that question was changed/erased or re-worded. The new questions were then sent out to people for them to answer. This process continued for a while until the last 5 people were sent the complete revised new questions in which they all answered incorrectly. This advocated that buoyantly, the new questions could not be answered through naivety; they could merely be answered by watching the video the questions were based on.

Actual study:

The sample was contacted via, telephone/e-mail/ or social media. They were asked to take part in the study and were given a description of the study as seen in (Appendix 2 – i.e. "This study will be conducted in order to consider educational techniques and strategies for educators teaching their students in a class setting. This study seeks to identify what techniques are effective for educators use to help students learn better."). Once the person agreed to participate in the test the examiner gave them the option of going to their house/ Participants going to the examiners house or meeting in public place (colleges/coffee shops).

Every test began and ended the same way for all 90 participants. Each person was given their own leaflet describing the study and ensuring them that they do not have to participate if they don't want to, and that they were free to stop at any time they wish. The

three groups were given different booklets with their appropriate questions depending on their group. Closed-ended questions group (appendix 2), Open-ended questions group (appendix 3), and the Control group (appendix 4). After they finished the first task of watching the video and answering questions [if asked to], every group was given their second/last booklet (appendix 5) and was asked to follow the instructions on the booklet. The test took no more than 20 minutes per person.

Results:

Descriptive Statistics:

Accuracy of results. Table 1:

	Mean	S.D	N	Maximum	Minimum
Closed-Ended Question Group:	9.57	0.57	30	8	10
Open-Ended Questions Group:	8.67	1.15	30	6	10
Control Group:	4.73	1.48	30	3	8

Descriptive statistics including Means (M), Standard Deviations (SD), and Number of Participants (N), for the measured variable (Accuracy) are presented in *Table (1).* The Table shows that each Group shared the same amount of participants (N=30). The table shows that the Closed-Ended Question Group had more accurate results (M=9.57) rather than the Open-ended (M=8.67) or the Control Group (M=4.73).

Hypothesis 1:

Asking questions to participants during the simulated class will result in participants having a higher level of accuracy (better recall) compared to those who are not posed questions during the simulated class.

A one-way between groups analysis of variance was conducted to explore the difference in accuracy of answers between Participants asked questions during a simulated class to those who were not posed questions during the simulated class. There was a statistically significant difference at the $p < .001$ level in the accuracy of answers between Participants asked questions during the simulated class (Closed-ended and Open-ended questions group) $F (2, 87) = 154.1$, $p < .001$. As well as reaching statistical significance, the difference in mean scores between groups was quite large. The effect size, calculated using eta squared, was 3.54. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for how accurate participants answered questions during a simulated class was; Closed-ended questions group- ($M = 9.57$, $SD = 0.57$) and Open-ended questions group- ($M = 8.67$, $SD = 1.15$). These results were found to be significantly ($p < .001$) different compared to the Control Group-those who were not posed questions during the simulated class ($M = 4.73$, $SD = 1.48$).

Hypothesis 2:

Participants who are asked closed-ended questions during the simulated class will have a

higher level of accuracy (better recall) compared to those who are who are asked open ended questions during the simulated class.

A one-way between groups analysis of variance was conducted to explore the difference in accuracy of answers between Participants asked closed-ended questions during the simulated class to those who were who are asked open ended questions. There was a statistically significant difference at the $p < .001$ level in the accuracy of answers by the closed-ended questions group. $F (2, 87) = 154.1$, $p = .008$. As well as reaching statistical significance, the difference in mean scores between groups was quite large. The effect size, calculated using eta squared, was 3.54. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for how accurate the Closed-ended questions group answered questions during the simulated class was; ($M = 9.57$, $SD = 0.57$) and was found to be significantly ($p < .001$) different compared to the Open-ended questions group- ($M = 8.67$, $SD = 1.15$).

Hypothesis 3:

Both experimental groups (Open-ended and Closed-ended questions group) will have a higher level of accuracy (better recall) in phase 2 (test at the end of the video) compared to phase 1 (test throughout the video).

A paired samples t-test was conducted to evaluate both experimental groups (Open-ended and closed-ended questions groups) to see will they have a higher level of accuracy in phase 2 compared to phase 1. There was a significant increase in scores from Phase 1 ($M = 7.48$, $SD = 1.95$) to Phase 2 ($M = 9.12$, $SD = 1.01$), $t(59) = -7.80$, $p < .001$ (two-tailed). The mean increase in accuracy scores was -1.64 with a 95% confidence interval ranging from 2.06 to -1.22. The eta squared statistic (34.8) indicated a very large effect size.

Additional Findings (1):

There will be a significant difference between the three groups perceived level of enjoyment and difficulty.

A one-way between groups analysis of variance was conducted to explore the differences in perceived difficulty of the task between the 3 groups. Group 1= Closed-ended Questions group, Group 2= Open-ended Questions group, Group 3= Control group. There was a

statistically significant difference for three groups F (2, 87) = 36.58, p<.001). As well as reaching statistical significance, the difference in mean scores between groups was quite big. The effect size, calculated using eta squared, was 0.45. Post-hoc comparisons using the Tukey HSD test indicated all groups were significantly different. The Closed-ended group had a significantly lower difficulty ranking (M= 6.033; SD=.9643) than the Open-ended group (M= 4.97; SD=.9279) and the Control group (M= 3.500; SD=1.480).

A one-way between groups analysis of variance was conducted to explore the differences in perceived enjoyment of the task between the 3 groups. Group 1= Closed-ended Questions group, Group 2= Open-ended Questions group, Group 3= Control group. There was a statistically significant difference for three groups F (2, 87) = 23.25, p<.001). As well as reaching statistical significance, the difference in mean scores between groups was quite big. The effect size, calculated using eta squared, was 0.35. Post-hoc comparisons using the Tukey HSD test indicated all groups were significantly different. The Closed-ended group had a significantly higher enjoyment ranking (M= 2.400; SD=1.003) than the open ended group (M= 3.100; SD=.9229) and the control group (M= 4.1333; SD=1.042).

Additional Findings (2):

There is a relationship between the participants' perceived enjoyment, difficulty and how accurate their answers were.

The relationship between the perceived enjoyment, difficulty and accuracy of answers was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a strong, negative correlation between difficulty and accuracy, r = -.59, n = 90, p < .01, with higher levels of perceived enjoyment associated with the accuracy of the answers. There was a strong, positive correlation between enjoyment and accuracy, r = .50, n = 90, p < .01, with lower levels of perceived difficulty associated with the inaccuracy of the answers.

Discussion:

The aim of this research was to identify the techniques that are effective for educators to use to help improve students' learning and academic achievement. The techniques that were investigated in this study were; whether asking questions is effective in recall of information presented rather than not asking questions, the specific type of questions a teacher should ask in order to receive accurate recall of the presented information, and the

effectiveness of re-testing. The findings will be discussed in relation to the hypotheses of this study and in relation to published literature. Strengths and limitations of the present study are addressed and recommendations for future research are also explored.

The first hypothesis **(Hypothesis 1)** stated that asking questions to participants during the simulated class will result in participants having a higher level of accuracy (better recall) compared to those who are not posed questions during the simulated class. To test this hypothesis a one-way between groups analysis of variance was conducted. The results accept the hypothesis and show that there was a statistically significant difference in the accuracy of answers between the participants who were asked questions during the simulated class (Closed-ended and Open-ended questions group), compared to those who were not posed questions (Control Group). This finding is supported by the literature which suggests that; Teachers' asking their students' questions during class is a vital part of a teacher's selection of educational techniques with significant results to back up its association to student success. (Cotton, 2007, p.3). The current results also relate to Moeser's (1978) findings how questions asked while a piece of information is being presented will positively affect later re-call of that particular information.

The second hypothesis **(Hypothesis 2)** stated that participants who are asked closed-ended questions during the simulated class will have a higher level of accuracy (better recall) compared to those who are who are asked open ended questions during the simulated class. To test this hypothesis a one-way between groups analysis of variance was conducted. The results accept the hypothesis and show that there was a statistically significant difference in the accuracy of answers by the Closed-ended questions group compared to the Open-ended questions group. This finding is supported by the literature which suggests that; Closed-ended questions have more carefully distinct correct answers which can be recalled from memory, are common in conventional tests, and are better for students' recall of information. (Darn & Çetin, 2010; Glass and Sinha, 2013, p.471). The current results also relate to Anderson & Krathwohl's (2001) revision of Bloom's (1956) Taxonomy of Educational Objectives, where they found that questions that require lower-level thinking (MCQs) are perceived as questions of fact, where students are asked to give an accurate recall of something and to assess a student's basic knowledge and comprehension. Also relating to Roediger, Agarwal, McDaniel, & McDermott's (2011) findings suggesting that; Closed-ended question (MCQ) tests enhance student's performance on both short-answer questions and free recall tests.

The third hypothesis **(Hypothesis 3)** stated that both experimental groups (Open-ended and Closed-ended questions group) will have a higher level of accuracy (better recall) in phase 2 (test at the end of the video) compared to phase 1 (test throughout the video). To test this hypothesis a paired samples t-test was conducted. The results accept the hypothesis and show that there was a statistically significant increase in scores from Phase 1 to Phase 2. This finding is supported by the literature which suggests that; immediate testing after exposure of material has a good effect on retention especially short-term. Re-testing can help a students' performance by using a follow-up test using both short-answer questions and multiple-choice questions. (Roediger & Karpicke, 2006). The performance of students' are far better in tests when they were previously exposed to the questions before the test in opposed to not being exposed to the questions. (Cotton, 2007, p.4). The current results also relate to findings suggesting that re-testing improves recall more than any other learning technique and this can happen without feedback. studies established that primary cued-recall testing improved following recall more than did re-studying (Halamish & Bjork, 2011, p. 801; Rowland, 2014, p. 1438; Duchastel, 1981, p. 218). A similar study to the current one was conducted by Nungester & Duchastel (1982) where they had three groups of people read a piece of writing from a book, afterwards Group 1- took a test on the piece of writing, Group 2- spent equal time reviewing the piece of writing, Group 2- were undergoing a separate task (control group). Results show that in the follow-up retention test given two weeks later to all groups, Group 1-the test condition group had significantly better retention of the piece of writing rather than the other two groups (pp. 18 & 21).

Strengths/ Limitations/ Future Research:

This study was primarily limited by its small sample size (N=90) due to lack of resources, time and means of approaching a bigger sample. An earlier start in data collection would have increased the time needed to survey more participants Because of these limitations the examiner had to contact the participants through convenience sampling and during the actual experiments there was times where it was very noisy (Café's/College cafeterias) as a lab natured setting wasn't possible for some participants. Despite the limitations a major

strength for this study was that it was consistent with the literature where it sought to find the power of questions. This study also presents a significant step in investigation of active techniques for teacher's to apply to their class for to improve student learning. For future research this study could be conducted allowing non-English speakers to participate providing the examiner has the ability and knowledge to detect and understand different languages, this could increase ethnicity and be more productive in helping to approach a bigger sample to generalise the results.

Conclusion:

In conclusion of this study it's fair to say that in order for effective learning to occur, Teachers must educate themselves on all the possible techniques and theories of learning. This study provides a review of the literature revolving around learning and a test that sought to provide additional confirmation to the current literature. This study has identified the importance of questioning, the significance of different types of questions and the impact of re-testing on retention. The results of this research accepted the hypotheses, found significance results between all three hypotheses and supported the existing literature.

Reference:

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York, NY: Longman.

Blake, B., & Pope, T. (2008). Developmental Psychology: Incorporating Piaget's and Vygotsky's Theories in Classrooms. *Journal of Cross-Disciplinary Perspectives in Education, 1*(1), 59-67. Retrieved from http://jcpe.wmwikis.net/file/view/blake.pdf

Bloom, Benjamin S. & David R. Krathwohl. (1956). Taxonomy of educational objectives: The classification of educational goals, by a committee of college and university examiners. Handbook 1: Cognitive domain. New York, Longmans.

Blosser, P. E., & National Science Teachers Association. (2000). *How to Ask the Right Questions*. Retrieved from http://www.nsta.org/docs/201108bookbeathowtoasktherightquestions.pdf

Bruner, J. S. (1960). The Process of Education. Oxford, England: Harvard University Press.

Cotton, K. (2007). Classroom Questioning. *School Improvement Research Series*, (5), 1-18. Retrieved from http://edc371-01.wikispaces.com/file/view/Classroom+Questioning.pdf

Craik, F. I., & Lockhart, R. S. (1972). Levels of Processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behaviour*, 11(6), 671-684. doi:10.1016/S0022-5371(72)80001-X

Dahl, B. (1996). *A synthesis of different psychological learning theories?* Piaget and Vygotsky, 1-24.

Daniels, H. (2001). Vygotsky and pedagogy. New York: Routledge Falmer

Darn, S. & Çetin, F. (February, 3rd, 2010). Asking Questions. British Council, BBC. Retrieved March 10th, 2015, from http://www.teachingenglish.org.uk/article/askng-questions

Duchastel, P. (1981). Retention of prose following testing with different types of test. *Contemporary Educational Psychology*, 6, 217-226. Retrieved from https://www.gwern.net/docs/spacedrepetition/1981-duchastel.pdf

Gall, M. D. (1970). Review of Educational Research. *The Use of Questions in Research*, *40*(5), 707-721. Retrieved from http://www.jstor.org/stable/1169463

Gilson, C. M., Little, C. A., Ruegg, A. N., & Davis, M. B. (2014). An Investigation of Elementary Teachers' Use of Follow-Up Questions for Students at Different Reading Levels. *Journal of Advanced Academics*, *25*(2), 101-128. doi:10.1177/1932202X14532257

Glass, A. L., & Sinha, N. (2013). Multiple-choice questioning is an efficient instructional methodology that may be widely implemented in academic courses to improve exam

performance. Current Directions Psychological Science, 22(6), 471-477. doi:10.1177/09637214134

Halamish, V., & Bjork, R. A. (2011). When Does Testing Enhance Retention? A Distribution-Based Interpretation of Retrieval as a Memory Modifier. *Journal of Experimental Psychology-learning Memory and Cognition*, *37*(4), 801-812. doi:10.1037/a0023219

Haynie, W. J. (2007). Effects of Test Taking on Retention Learning in Technology Education: A Meta-Analysis. *Journal of Technology Education*, *18*(2), 24-36. Retrieved from http://scholar.lib.vt.edu/ejournals/JTE/v18n2/pdf/haynie.pdf

Kazdin, A. E. (2000). *Encyclopaedia of psychology* (Vol. 8, p. 4128). Washington, DC: American Psychological Association.

Moeser, S. D. (1978). Effect of questions on prose unitization. Journal of Experimental Psychology: Human Learning and Memory, 4(4), 290-303. doi:10.1037/0278-7393.4.4.290

Nungester, R. J., & Duchastel, P. C. (1982). Testing versus review: Effects on retention.*Journal of Educational Psychology*, *74*(1), 18-22. doi:10.1037//0022-0663.74.1.18

Okano, H., Hirano, T., & Balaban, E. (2000). Learning and Memory. Retrieved from http://www.pnas.org/content/97/23/12403.full.pdf

Robert, C., & Brian, V. (2014). The Socratic Method and Pimping: Optimizing the Use of Stress and Fear in Instruction. *American Medical Association Journal of Ethics*, *16*(3), 182-186. Retrieved from http://journalofethics.ama-assn.org/2014/03/pdf/medu2-1403.pdf

Roediger, H. L., III, Agarwal, P. K., McDaniel, M. A., & McDermott, K. B. (2011). Test-enhanced learning in the classroom: Long-term improvements from quizzing. Journal of Experimental Psychology: Applied, 17, 382–395. doi:10.1037/a0026252

Roediger, H. L., & Karpicke, J. D. (2006). Test-Enhanced Learning: Taking Memory Tests Improves Long-Term Retention. *Psychological Science*, *17*(3), 249-255. doi:10.1111/j.1467-9280.2006.01693.x

Rowland, C. A. (2014). The Effect of Testing Versus Restudy on Retention: A Meta-Analytic Review of the Testing Effect. *Psychological Bulletin*, *140*(6), 1432-1463. doi:10.1037/a0037559

Spörrle, M., Gerber-Braun, B., & Försterling, F. (2007). The Influence of Response Lines on Response Behavior in the Context of Open-Question Formats. *Swiss Journal of Psychology*, *66*(2), 103-107. doi:10.1024/1421-0185.66.2.103

Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Cambridge, Massachusetts: Harvard University Press.

Yali, G. (2010). L2 Vocabulary Acquisition Through Reading —Incidental Learning and Intentional Learning. *Chinese Journal of Applied Linguistics*, *33*(1), 74-93. Retrieved from http://www.celea.org.cn/teic/89/10042205.pdf

Appendix 1: Experimenters/Teachers Document

The YouTube channel link the students' will be asked questions on is titled

'The Learning Brain' http://www.youtube.com/watch?v=cgLYkV689s4

Question.1: **Pause at 00:40**

Why do your eyes blink without you even thinking about it?

A: Because you have dust in your eyes

B: Because your brain tells it too to do so

C: Because your brain is telling you that your eyes are irritated

D: Because a minor dysfunction has just occurred in your brain which makes your eyes blink

Answer = B

Question.2: **Pause at 1:00**

What is the brain most important for?

A: understanding/evaluating/appraising

B: Counting/problem solving/labelling

C: Thinking/Remembering/Learning

D: Language development/concept formation

Answer = C

Question.3: **Pause at 1:15**

How much bigger is an elephant's brain to a human's brain?

A: 2 to 3 times bigger

B: 3 to 4 times bigger

C: 4 to 5 times bigger

D: 5 to 6 times bigger

Answer = C

Question.4: **Pause at 1:31**

What is the biggest part of your brain?

A: Cerebellum

B: Cerebrum

C: Brain Stem

D: Corpus Callosum

Answer = B

Question.5: **Pause at 2:32**

To function properly the brain depends on:

A: Membrane

B: Synapse

C: Neurons

D: Pathways

Answer = C

Question.6: **Pause at 3:59**

Under what circumstances would the brain release the chemicals: Adrenaline and Cortisol?

A: When a person feels happy or excited

B: When a person feels exposed and defenceless

C: When a person feels threatened or worried

D: When a person feels sad and depressed

Answer = C

Question.7:

Being dehydrated can mean that? **Pause at 4:36**

A: Your weight can fluctuate

B: Memory stored in your brain can be easily misplaced

C: Your thinking can be less effective

D: You have too much salt in your diet

Answer = C

Question.8:

When you're tired, hungry, too hot or cold it's unlikely that you'll be able to? **Pause at 5:19**

A: Have a normal sleep pattern

B: Concentrate effectively on learning

C: Answer any pretentious question accurately

D: Maintain a healthy lifestyle

Answer = B

Question.9:

The more you use your brain, the…? **Pause at 6:05**

A: … More efficient you become at problem solving

B: … more skilled it will be at language development

C: … Greater the chances of it being protected by unusual sensations

D: … More efficient it will become

Answer = D

Question.10:

The more you exercise, the more …? **Let it play to the end**

A: … The level of oxygen increases in your blood

B: … Your brain gets its' nutrients from the release of toxins

C: … The level of adrenaline increases in to your body

D: … Stronger your brain ability becomes

Answer = A

Appendix 2: Participants asked Closed-ended Questions Document:

You are asked to watch a 7 minute video in which you will answer 10 short questions throughout and 10 short questions after the video. Please base your responses on the content of the video. You will be also asked a short questionnaire on information about yourself such as age, gender and so forth. All you need for this test is to be able to write, hear and have fluent English in order to understand the video. This should take no more than 30 minutes in total. Any information gathered today will be analysed and then discarded safely roughly one year post the study. You are not permitted to provide any personal details about yourself that could make you identifiable such as your name, address and so on. You will be given a number and you are asked to write that number down at the top of any sheet you are given where it states **Number:** _____

This study will be conducted in order to consider educational techniques and strategies for educators teaching their students in a class setting. This study seeks to identify what techniques are effective for educators use to help students learn better. The techniques that will be researched in this study are; weather asking questions is effective in recall of information presented rather than not asking questions, and; what are the specific type of questions a teacher should ask in order to receive accurate recall of the presented information.

Please feel free to leave anytime during this test and note that you are 'NOT' in any way under pressure to stay.

The YouTube channel link you will be asked questions on is titled

'The Learning Brain'

http://www.youtube.com/watch?v=cgLYkV689s4

Now the video will begin. Below are the questions you will have to answer on the video throughout the duration of the video. The video will be paused in order for you to read and answer the questions.

Your Number: _____

For all 10 question you can answer in the form of (A/B/C/D)

Question.1:
Why do your eyes blink without you even thinking about it?
A: Because you have dust in your eyes
B: Because your brain tells it too to do so
C: Because your brain is telling you that your eyes are irritated
D: Because a minor dysfunction has just occurred in your brain which makes your eyes blink
Answer =

Question.2:

What is the brain most important for?

A: understanding/evaluating/appraising

B: Counting/problem solving/labelling

C: Thinking/Remembering/Learning

D: Language development/concept formation

Answer =

Question.3:

How much bigger is an elephant's brain to a human's brain?

A: 2 to 3 times bigger

B: 3 to 4 times bigger

C: 4 to 5 times bigger

D: 5 to 6 times bigger

Answer =

Question.4:

What is the biggest part of your brain?

A: Cerebellum

B: Cerebrum

C: Brain Stem

D: Corpus Callosum

Answer =

Question.5:

To function properly the brain depends on:

A: Membrane

B: Synapse

C: Neurons

D: Pathways

Answer =

Question.6:

Under what circumstances would the brain release the chemicals: Adrenaline and Cortisol?

A: When a person feels happy or excited

B: When a person feels exposed and defenceless

C: When a person feels threatened or worried

D: When a person feels sad and depressed

Answer =

Question.7:

Being dehydrated can mean that?

A: Your weight can fluctuate

B: Memory stored in your brain can be easily misplaced

C: Your thinking can be less effective

D: You have too much salt in your diet

Answer =

Question.8:

When you're tired, hungry, too hot or cold it's unlikely that you'll be able to?

A: Have a normal sleep pattern

B: Concentrate effectively on learning

C: Answer any pretentious questions accurately

D: Maintain a healthy lifestyle

Answer =

Question.9:

The more you use your brain, the…?

A: … More efficient you become at problem solving

B: … more skilled it will be at language development

C: … Greater the chances of it being protected by unusual sensations

D: … More efficient it will become

Answer =

Question.10:

The more you exercise, the more …?

A: … The level of oxygen increases in your blood

B: … Your brain gets its' nutrients from the release of toxins

C: … The level of adrenaline increases in to your body

D: … Stronger your brain ability becomes

Answer =

Appendix 3: Participants asked Open-ended Questions Document:

You are asked to watch a 7 minute video in which you will answer 10 short questions throughout and 10 short questions after the video. Please base your responses on the content of the video. You will be also asked a short questionnaire on information about yourself such as age, gender and so forth. All you need for this test is to be able to write, hear and have fluent English in order to understand the video. This should take no more than 30 minutes in total. Any information gathered today will be analysed and then discarded safely roughly one year post the study. You are not permitted to provide any personal details about yourself that could make you identifiable such as your name, address and so on. You will be given a number and you are asked to write that number down at the top of any sheet you are given where it states **Number:_____**

This study will be conducted in order to consider educational techniques and strategies for educators teaching their students in a class setting. This study seeks to identify what techniques are effective for educators use to help students learn better. The techniques that will be researched in this study are; weather asking questions is effective in recall of information presented rather than not asking questions, and; what are the specific type of

questions a teacher should ask in order to receive accurate recall of the presented information.

Please feel free to leave anytime during this test and note that you are ‘NOT’ in any way under pressure to stay.

The YouTube channel link you will be asked questions on is titled

'The Learning Brain'

http://www.youtube.com/watch?v=cgLYkV689s4

Now the video will begin. Below are the questions you will have to answer on the video throughout the duration of the video. The video will be paused in order for you to read and answer the questions.

Number: _____

Question.1:
Why do your eyes blink without you even thinking about it?
Answer =

Question.2:
What is the brain most important for?
Answer =

Question.3:
How much bigger is an elephant’s brain to a human’s brain?
Answer =

Question.4:

What is the biggest part of your brain?

Answer =

Question.5:

To function properly the brain depends on:

Answer =

Question.6:

Under what circumstances would the brain release the chemicals: Adrenaline and Cortisol?

Answer =

Question.7:

Being dehydrated can mean that?

Answer =

Question.8:

When you're tired, hungry, too hot or cold it's unlikely that you'll be able to?

Answer =

Question.9:

The more you use your brain, the…?

Answer =

Question.10:

The more you exercise, the more …?

Answer =

Appendix 4: Participants not asked Questions Document:

You are asked to watch a 7 minute video in which you will answer 10 short questions after the video. Please base your responses on the content of the video. You will be also asked a short questionnaire on information about yourself such as age, gender and so forth. All you need for this test is to be able to write, hear and have fluent English in order to understand the video. This should take no more than 30 minutes in total. Any information gathered today will be analysed and then discarded safely roughly one year post the study. You are not permitted to provide any personal details about yourself that could make you identifiable such as your name, address and so on. You will be given a number and you are asked to write that number down at the top of any sheet you are given where it states

Number: _____

This study will be conducted in order to consider educational techniques and strategies for educators teaching their students in a class setting. This study seeks to identify what techniques are effective for educators use to help students learn better. The techniques that will be researched in this study are; weather asking questions is effective in recall of information presented rather than not asking questions, and; what are the specific type of questions a teacher should ask in order to receive accurate recall of the presented information.

Please feel free to leave anytime during this test and note that you are 'NOT' in any way under pressure to stay.

The YouTube channel link you will be asked questions on is titled

'The Learning Brain'

http://www.youtube.com/watch?v=cgLYkV689s4

Appendix 5: Questionnaire all participants are asked at the end of the video Document:

Your Number: _____

For all 10 question you can answer in the form of (A/B/C/D)

Question.1:

Why do your eyes blink without you even thinking about it?

A: Because you have dust in your eyes

B: Because your brain tells it too to do so

C: Because your brain is telling you that your eyes are irritated

D: Because a minor dysfunction has just occurred in your brain which makes your eyes blink

Answer =

Question.2:

What is the brain most important for?

A: understanding/evaluating/appraising

B: Counting/problem solving/labelling

C: Thinking/Remembering/Learning

D: Language development/concept formation

Answer =

Question.3:

How much bigger is an elephant's brain to a human's brain?

A: 2 to 3 times bigger

B: 3 to 4 times bigger

C: 4 to 5 times bigger

D: 5 to 6 times bigger

Answer =

Question.4:

What is the biggest part of your brain?

A: Cerebellum

B: Cerebrum

C: Brain Stem

D: Corpus Callosum

Answer =

Question.5:

To function properly the brain depends on:

A: Membrane

B: Synapse

C: Neurons

D: Pathways

Answer =

Question.6:

Under what circumstances would the brain release the chemicals: Adrenaline and Cortisol?

A: When a person feels happy or excited

B: When a person feels exposed and defenceless

C: When a person feels threatened or worried

D: When a person feels sad and depressed

Answer =

Question.7:

Being dehydrated can mean that?

A: Your weight can fluctuate

B: Memory stored in your brain can be easily misplaced

C: Your thinking can be less effective

D: You have too much salt in your diet

Answer =

Question.8:

When you're tired, hungry, too hot or cold it's unlikely that you'll be able to?

A: Have a normal sleep pattern

B: Concentrate effectively on learning

C: Answer any pretentious questions accurately

D: Maintain a healthy lifestyle

Answer =

Question.9:

The more you use your brain, the…?

A: … More efficient you become at problem solving

B: … more skilled it will be at language development

C: … Greater the chances of it being protected by unusual sensations

D: … More efficient it will become

Answer =

Question.10:

The more you exercise, the more …?

A: … The level of oxygen increases in your blood

B: … Your brain gets its' nutrients from the release of toxins

C: … The level of adrenaline increases in to your body

D: … Stronger your brain ability becomes

Answer =

Please answer the following:

1: Age _____

2: Gender _____

3: Employment status _____

4: Educational status _____

6: Highest Level of Education Achieved: _____

Q11 (A, B, C, D, & E): 7 point Likert scale

A: How difficult was this test, (1 being very difficult and 7 being very easy) Circle your answer.

1	2	3	4	5	6	7

B: How much did you enjoy this test (1 being very enjoyable and 7 being not at all enjoyable) Circle your answer.

1	2	3	4	5	6	7

C: How frequently do you watch YouTube Videos to help you study? (1 being always and 7 being never) Circle your answer.

1	2	3	4	5	6	7

D: How difficult did you find being asked questions throughout the Video? (1 being very difficult and 7 being very easy) (This question may not apply to you). Circle your answer.

1	2	3	4	5	6	7

E: How difficult did you find being asked questions after the Video? (1 being very difficult and 7 being very easy) Circle your answer.

1 2 3 4 5 6 7