IMPLICIT THEORIES AND UNSUCCESSFUL RETRIEVAL: A STUDY OF LEARNING AMONG SECONDARY SCHOOL STUDENTS IN MANIPUR

Dissertation submitted to Jawaharlal Nehru University
in partial fulfilment of requirements
for the award of degree of

MASTER OF PHILOSOPHY

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2015

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DECLARATION

I, Salam Priyanka Devi, declare that this dissertation entitled **"Implicit Theories and Unsuccessful Retrieval: A Study of Learning among Secondary School Students in Manipur"** is submitted by me in requirement of partial fulfilment for the degree of Master of Philosophy in Jawaharlal Nehru University. This is my own work. This dissertation has not been submitted for any other degree of this University or any other University.

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We recommend that this dissertation be placed before the examiners for evaluation and award of M.Phil degree of this university.

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Acknowledgments

First of all, I would like to thank my supervisor, Dr Arvind Kumar Mishra, for his constant support, guidance, and encouragement throughout the dissertation process. I have learned so much from his consistent feedback, and it really helped me to become a more competent researcher. Without his guidance none of this work would have been possible. He has been a great adviser and mentor, and I am so happy and grateful that I had the opportunity to work with him. In initial days, I was facing communication problems, but he has been always supporting and encouraging me to put my ideas, had time and enormous patience for discussions with me. Thank you for teaching me how to conduct research, and for allowing me to dream up a research that I truly loved.

I would like to thank to Prof. Geetha B. Nambissan, and Prof. Minati Panda for their invaluable insights and comments that helped in shaping the dissertation further. I would also like to thank all my faculty members, Prof. Dhruv Raina, Prof. Binod Khadria, Prof. Deepak Kumar, Dr. Srinivasa Rao, Dr. Parimala Rao, Dr. Saumen Chattopadhyay, and Dr. Suresh Babu for guiding me in the journey of my research through their classroom teaching.

I would also like to thank the principal, teaching staff, and hostel caretaker of the School where I conducted my experiment they letting me to collect data for this study. And I also thank all the students who participated in this study for their

cooperation in filling the questionnaires. I would also like to thank Sir, Kesho, Anand, Athoi and DaTomba for their great support in data collection.

I would also like to thank my seniors Neha and Divya for their appreciative feedback and encouragement, I am extremely grateful. I would also like to thank my friends Isaac, Gulnaz, Ruby, Shreela, Vinika, Lun, Banti, Subin, Viola, who made this experience very enjoyable.

Finally, my hearty thanks to my parents, who always wished me to go for higher studies. You are the bedrock of all my achievements. And I owe huge thanks to my brothers, Manimohon, Anand, Bijen, Babu, Aendrio, and my sister Asha for all of their love and constant encouragement to achieve the best. Thanks to my friends, relative and cousins for all their love and support. Completing this thesis has been as much a challenge of endurance and motivation as anything else and their love and support has kept me grinding through the lows and flying through the highs.

(Salam Priyanka Devi)

IMPLICIT THEORIES AND UNSUCCESSFUL RETRIEVAL: A STUDY OF LEARNING AMONG SECONDARY SCHOOL STUDENTS IN MANIPUR

Abstract

From prior research we know that tests enhance more learning than the additional study (Halamish & Bjork, 2011), which is also known as testing effect (Richland, Kao, & Kornell, 2008; Roediger & Karpicke, 2006). Successful tests observably play a unique role in future learning. Evaluative processes are often considered as key elements of social perception, and it is also believed that evaluation is typically an integral part of trait attribution (Dweck & Leggett, 1988; Dweck, Chiu, & Hong, 1995). Thus, implicit theories of self-attributes will play an important role in learning. Prior researches have shown that those individuals who hold entity theory (fixed or stable belief) focus on one's own innate ability than those who hold incremental theory (malleable mindset). Past researches suggest that learning is not simply a process of encoding, and storing information in memory (Bjork et al. 2013; Wickelgren 1981). Learner has to be an active participant in learning processes. Recent finding suggests that even unsuccessful retrieval enhances learning, though students do not provide correct responses in a test (Huelser & Metcalfe 2011; Knight et al. 2012). Past research by Kornell et al. (2009) suggests that unsuccessful tests have positive effect on subsequent learning when feedback is provided. Benefits of tests occur in both situations-under retrieval

success as well as retrieval failure. But, it does not mean that unsuccessful retrieval and successful retrieval are equally effective. In educational context, retrieval is often considered as measurement of learning, not as a process that contributes to learning. The present study is based on the assumption that unsuccessful retrieval enhances learning, wherein we examined the impact of testing and reading on final recall. In this research there are four stages were involved. First, we tested participants' implicit theories of intelligence that is what kind of belief they hold about their intelligence. In second phase, we tested the recall of the subjects under two different conditions - test condition and read only condition using sixty word-pairs (thirty related and thirty unrelated). Later on, the distractor task was given for five minutes. Finally, there was cued-target recall test for all of the word-pairs. We used *2X2X2 (implicit theories x conditions x nature of word pairs) mixed design*, repeated on last two factors. Results indicated that there was no significant difference in the recall of entity and incremental theory holders. Relatively testing had more beneficial effect on recall than simply reading materials. We also found that incorrect guesses in unsuccessful retrieval attempts of the related and unrelated word-pairs played a mediating role in final recall. Interaction effect of conditions (test and read only) and nature of word-pairs (related and unrelated) on recall was found to be significant. That is, unsuccessful retrieval attempts enhanced learning in both types of condition and both types of materials. And the interaction effect of implicit theories and conditions had shown non-significant results. But the interaction effect of implicit theory and nature of word-pairs on recall was found to be significant. Overall finding of our results suggest that test taking enhances

learning than simply reading, even if there unsuccessful retrieval in test. This finding has practical implications for both learners and educators.

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Chapter 1

Introduction and Dissertation Overview

1.1 Introduction

The main argument of this dissertation is that, failing a test does not necessarily mean that learning is not progressing. Researchers like Kornell, et al. (2009) suggest that unsuccessful tests have positive effect on learning even when feedback is not provided. Hence, benefits of testing shouldn't be limited to evaluation process. However, in formal education, retrieval is often considered as an assessment process, not as a process that contributes to learning.

And, it is also believed that if students make mistakes in an exam it is generally viewed as an inadequacy of the learner. But recent researches by Kornell et al. (2009) suggest that benefits of testing occur in both situations, under retrieval success, as well as, retrieval failure. Successful performances in tests play beneficial role in future learning, but, recent researches have pointed out that receiving negative feedback does not harm learning, when learners are willing to take a challenging approach to correct their committed errors. Getting feedback is an opportunity to improve their weak zone.

Unsuccessful retrieval has positive effect on learning when feedback is provided (Kane & Anderson, 1978). But it does not mean that unsuccessful tests and successful tests equally benefit in learning. Richland et al. (2008) suggest that

study of unsuccessful retrieval is important for "all children have a fair, equal, and significant opportunity to obtain a high quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments." Therefore, no child is left behind from formal education.

Prior research pointed that making error is not a wrong doing until they persevere to makeup. Learners have to focus on deep processing routes of learning, so that information can be available at any time and also benefit from long-term retention (Bjork et al. 2013; Grimaldi & Karpicke 2012; Karpicke & Grimaldi 2012; Kornell, Hays, & Bjork 2009). From past century, researchers have discovered that testing has a potential learning events and test do more than mere diagnosis of one's own learning ability (Gates 1917; Spitzer 1939). In addition, Kang et al. (2011) suggested that wrong guesses do not harm learning when correct information is provided, but feedback shouldn't be immediate. Otherwise, it may show erroneous responses and result in deleterious learning.

Karpicke & Grimaldi (2012) suggest that there are two main ideas on *retrieval-based learning*. "First, retrieval is the key process for understanding learning. Second, retrieval is not a neutral assessment of the contents of one's mind, but the process of retrieval itself contributes to learning". And amount of time students spend for learning which is directly related to their actual long-term performance. However, there are quite few researches which had been done on the effect of failure on learning. In this field, some researchers are more concerned with negative effect and others are dealing with positive consequences. Prior researches

suggest that negative effects of underperformance are caused by uncontrollable reason. Repeated failure which is not only the single product of motivational deficits but, setting an inappropriate goal, and lack of functional commitment are the main causal factors of failure (Baumeister et al. 1993; Brunstein & Gollwitzer, 1996).

One who attributes failures in terms of stable and fixed ability shows helplessness response in the face of failures. Whereas, those who perceive failures in terms of controllable trait are more willing to adopt learning goals, thus, they can gain mastery over the task. Therefore, we introduce implicit theories of intelligence in this study so that these theories could explain better how an individual can react differently in given situations (i.e., entity & incremental theory).

Test taking during the learning process results in greater retention than simply reading does, even when tests are given without feedback (Karpicke & Grimaldi, 2012). Hartwig & Dunlosky's (2012) survey on 324 college students of Kent State University, found that testing and re-reading were significantly correlated with students' grade point average. Tests enhance learning more than the additional study opportunities do (Halamish & Bjork 2011); this fact of testing is known as *testing effect*, and sometimes it referred as *retrieval practice* (Kang, McDaniel, & Pashler 2011).

In educational practice, test is most ubiquitous element, and primarily considered as a means of evaluative assessment. Through testing we know that

learner is able to understand that given material or not. Therefore, retrieval is generally considered as assessment means and not as a process of generating learning. Hence, testing is not considered as a part of learning. Most of the students do not consider testing as a strategy for enhancing learning. Karpicke, Butler, & Roediger (2009) conducted a survey to know the strategies from students of Washington University. They asked questions like, "What kind of strategies do you use when you are studying". Only 11% of participants reported that they use retrieval practising.

Moreover, we know that successful retrieval has played a unique role in future learning. Is it that successful retrieval of a test is the only way to enhance learning? Various questions had emerged in this context, like what if student does not answer correctly in a test then what would be the possible effect? Does unsuccessful retrieval cause to detriment the subsequent learning or it may also facilitate learning? The review of literature presents contradictory finding on this question.

Prior research suggests that when learners make a mistake on multiple-choice test, that error may consistently occur in future context (Kornell et al. 2009). Benefit of test strengthens the retrieval route, but in case of unsuccessful retrieval it plays counterproductive role. Recent research suggests that unsuccessful retrieval plays a major role in enhancing subsequent learning. Knight et al. (2012) indicated that generally test provided an additional opportunity to learn, that is, from feedback. But in the process of test taking certain errors unavoidably happen from

the learner's side. Similarly, Richland et al. (2009) suggested that testing enhances memory even if learners did not answer correctly.

Furthermore, Slamecka and Fevreiski (1983) observed that test taking benefits in subsequent learning, even when it generated unsuccessful response. As making error may be a cause of low performance in the beginning, learners as well as educators are more hesitant to adopt testing as a learning process. Huelser & Metcalfe (2011) in their study found that subjects were not aware of the fact that committing an error is more beneficial in the memory processes, even they substantially benefit from that.

However, people's belief about intelligence plays an important role in learning. Researchers working in this field of implicit theory of self attributes have argued that people holding different beliefs (such as intelligence, ability etc.) process failure information in different ways. Unsuccessful retrieval in test is a negative feedback, so we believed that different theory holders of intelligence will react differently in this given situation. Therefore we link implicit theories of intelligence with unsuccessful retrieval to examine its effect on subsequent learning.

The implicit theories of intelligence mainly focus on people's self-belief about fixedness versus malleability of intelligence. Entity theory holders mainly have beliefs about fixed and stable nature of one's ability. Entity theory holders are more aware of self-evaluating perceptions, for them how they perceive themselves is also

very important. Because of this fixed ability beliefs they assume that their ability cannot change too much with effort. Whereas incremental theory refers to the belief that intelligence is malleable in nature, through effort and practice it can be changed.

Therefore, implicit theory of intelligence may be hypothesized as a significant predictor of the key motivational variables. Meaning of feedback is different for different theory holders of intelligence because students who hold entity theory after getting negative feedback they were diverted from the given task. According to Dweck & Leggett (1988) within generalized condition, self-esteem of the entity theory holders are more acquired through performance goals, whereas self-esteem would be different for incremental theory holders; they were more prone to adopt learning goals.

When they get negative feedback, entity theory holders believe that their poor performance is because of their lack of ability. Thus, they showed helpless response in failure condition. In contrast, incremental theory holders are associated with strong learning goals. That is, students believe that their intelligence develop through effort. For them success is to undertake challenging task; they believe putting effort is the sign to become an efficient and effective learner. Incremental theory holders focus more on remedy of a problem, rather than highlighting their lack of abilities. Therefore, incremental theory holders are adaptive in nature (Hong et al. 1999).

The purpose of this dissertation is to extend the previous work on unsuccessful retrieval its effect on subsequent learning by linking it with the implicit theory of the learners. Generally, errors are typically viewed as inadequacies of the learners (Bjork et al. 2013; Karpicke & Grimaldi 2012). There is no single learning style which makes a person a fully effective learner. Failure of a task is not the end route of the learning. Learners should focus more on the remedy of the problem, rather than avoiding errors. Recognizing the committed errors and struggling to correct those errors is also a part of learning. Specially, the present research will focus on the circumstances where unsuccessful retrieval enhances or impedes subsequent learning. Unsuccessful retrieval is a negative feedback, how this information is processed by different implicit theories holders; that is, how entity and incremental theory holders react to this feedback of failures is what impacts on subsequent learning.

1.2 Dissertation overview

In educational context retrieval is considered only as a means of assessing knowledge; and not for generating learning. Karpicke & Grimaldi (2012) suggested that generally learners may not believe that testing is a best strategy to enhance learning. However, many researchers suggest that test taking enhances learning (Carpenter 2012; Carpenter et al. 2008; Karpicke & Roediger 2006a, 2006b; Wissman et al. 2011). But, there are contradictory findings on the effect of unsuccessful retrieval on subsequent learning. If information is successfully retrieved from memory it can enhance learning in many ways, such as retard forgetting, enhance subsequent learning, help in transferring information and so on. Kornell et al. (2009) pointed that unsuccessful retrieval which impedes subsequent learning is the idea comes from "errorless learning".

However, recent research on testing suggests that benefit of testing is applicable to successful retrieval as well as unsuccessful retrieval (Kornell et al. 2009). Kane & Anderson (1978) indicated that unsuccessful retrieval enhances learning when feedback is provided; otherwise errors would simply stay wrong. Richland et al. (2009) recommended that failure to answer a question should not be equated with failure to learn a task.

People's beliefs about intelligence play an important role in subsequent learning. In the present study, we examined the effect of implicit theories of intelligence and unsuccessful retrieval effect on subsequent learning. Under failure

condition, different implicit theory holders will react differently on their learning process. Unsuccessful retrieval is a form of negative feedback, how this information is processed by different implicit theory holders. How this belief effects on subsequent learning?

Chapter 2 provides a detail review of literature of testing effect on learning, and also analyses the prior studies done on unsuccessful retrieval. How feedback of failures will be linked to implicit theories of human attributions in influencing subsequent learning is the main issue of this chapter.

Chapter 3 provides the description of the present study in terms of participants, measures, design, results etc. In this study we used 2X2X2 mixed design (i.e., *implicit theories x conditions x nature of word-pairs*), repeated on last two factors.

Chapter 4 discusses the finding of our study in terms of theoretical constructs. Besides, it also mentions that contribution of the study to the literature in the field, practical implication, limitations and questions for future research, and the conclusion of the study.

Chapter2

Review of Literature

Past research suggests that there are different ways to enhance learning, but active involvement in learning is more beneficial to the learners (Blunt & Karpicke, 2014; Kornell et al. 2009). Many researchers suggest that testing is one means of active involvement in learning, and it enhances later retention. Testing enhances subsequent learning more than additional study does (Halamish & Bjork, 2011; Roediger & Karpicke, 2006a, 2006b). This is known as testing effect. Testing is a tool to enhance learning (e.g., Karpicke & Grimaldi, 2012; McDaniel, Roediger, McDermott, 2007; Roediger & Karpicke, 2006).

Karpicke & Grimaldi (2012) suggested that retrieval practices make more contribution in learning and it is defined in two broad ways. First, retrieval is the key process for understanding learning. Second, retrieval is not a neutral assessment of the contents of one's mind, but, the process of retrieval itself contributes to learning. They also pointed that the learner's performance is directly related to time which they spend in active learning process. Test enhances later retention than rereading, even when tests are presented without feedback. The benefit of testing is not a new idea at all.

Classic study of James (1890) in his work "Principles of Psychology", also pointed that "*A curious peculiarity of our memory is that things are impressed*

better by active than by passive repetition. I mean that in learning (by heart, for example), when we almost know the piece, it pays better to wait and recollect by an effort from within, than to look at the book again. If we recover the words in the former way, we shall probably know them the next time; if in the latter way, we shall very likely need the book once more (p. 646)".

According to Roediger & Karpicke (2006) there are two types of effect on learning; d*irect* and *indirect effect*. In direct effect on learning, test taking itself enhances subsequent learning, especially retention. This effect is not only the reason of additional exposure of the material, but it is also the result of additional studying. And in indirect effects on learning, test taking on regular basis is more beneficial to the learner than the massive study for few tests. If students were informed that testing would be conducted frequently, they can study throughout the course rather than study only prior to the main exam. Through testing they may get positive or negative feedback, so that they can manage their study guide. Positive feedback is related to success information and negative feedback is related to failure information.

Grigorenko & Sternberg (1998) suggested that testing is not only a product or processes of learning, but it is a potential to learn. Testing involves learning, it is not only for checking what he/she has already learned. The main idea of *dynamic testing* is to evaluate one's potential, whereas, static test measures the set of abilities and also level of their knowledge to predict subsequent cognitive development of the learners.

Brunstein & Gollwitzer (1996) suggest that helplessness response is caused by motivation deficit as well as functional deficits. It is very important to know how an individual views a task performance. How they can react to achieve a particular level? Bandura et al. (1996) pointed that person self-efficacy is directly linked to the effort they have dedicated to a task. In case of failure, those who have high self-efficacy are more focused on their work, persisting to a task; as a result, they can succeed in their academic work than the low self efficacy holders.

Steele (1975) suggested that 'negative name produces more compliance than the positive names'. Negative name calling is threatening to one's self-esteem; person is more willing to engage in other activities so that it would prevent worsening impact on self-esteem. Wicklund & Gollwitzer (1981) also suggest that receiving negative feedback about one's self-definition has high chances to produce self in positive ways.

Past research on goal setting suggests that those who set lower goals in some way sacrifice on career, prestige, as well as comfort zone. But, one can overcome it easily, thus a person may experience feeling of satisfaction not as a failure. Whereas, those who set higher goals have high chances to become a failure (Baumeister et al. 1993). Similarly, Roth et al. (1986) indicated that those who adopt high self-esteem are at greater tendency to make unrealistic positive claims about self. They tend to overestimate their capability, set an inappropriate goal. And, such goals they develop is difficult for them, thus their chances of failure would be high because of overconfidence. Whereas, low self-esteem is also an

error but it prevents making error, because that error may lead to diminishing their goal not as a failure. Moreover, several studies have pointed that low self-esteem may lead to developing poor self-schema and also deficiency in self knowledge (Campbell 1990).

Baumeister et al. (1993) suggested that there are two possible mechanisms that contribute to poor performance for those who have high self-esteem. First, it is because of transitory situation, people are more concerned about self-awareness. According to Greenberg & Pyszczynski (1986) it is very common for all of us to be more concerned and more self-aware when we face failure experience. This may lead to poor performance. Second, they increase their speed accuracy for attempting to achieve outstanding performance. But, increasing in speed may often lead to decrement in accuracy.

Reading a material several times is beneficial for short term purpose only but testing has long term benefits for the learners. Testing is simply better than re-reading several times. Testing reduces forgetting of that material and also multiple testing is more beneficial than single testing (Wheeler & Roediger, 1992). Jacoby (1978) indicated that testing is far better than simply re-reading material, even if the test were simple. And in testing spaced retrieval practice is more beneficial than massed practice (Bjork et al. 2013; Roediger & Karpicke, 2006).

2.1 Unsuccessful retrieval and its effect

Generally, people hardly believe that testing could enhance learning; instead they believe that re-reading is more beneficial for learning (Bjork et al. 2013; Roediger & Karpicke 2006). Kornell & Bjork (2008) and Simon & Bjork (2001) suggested that during learning process learners use ineffective strategies and also believe that those strategies are quite effective. According to Kornell et al. (2009) there are three types of benefits for testing, which can apply in both successful test as well as unsuccessful tests. First, "attempting to retrieve information from memory may result in deep processing in retrieval, thereby producing benefits similar to the effects of deep processing during encoding" (p.996). Second, testing material strengthens the retrieval routes than the untested materials. Finally, even when they couldn't retrieve information in a test, this incorrect information could play the role of a mediator. So that unsuccessful retrieval tries to connect to the correct answer.

Furthermore, benefit of testing should not be limited even if they were unsuccessfully retrieved; learners get feedback from that (Kornell et al. 2009). Interesting finding of unsuccessful retrieval is informed by Izawa (1970) suggesting that, if people commit more error in a test it can produce correct response than a single failure. In addition, Hays et al. (2012) pointed that information which was pretested items are more recalled on final test rather than untested items.

Kang et al. (2011) pointed that those learners who made wrong guesses at prior event were not affected at final recall performance. Berlyne (1954b, 1966) suggested that forced guesses to "prequestion" improved retention of the information. He argued that guessing enhances curiosity about the topics. Similarly, recent studies also found that prequestioning a topic before presenting the lectures have positive effects in learning (Kornell et al. 2009; Richland et al. 2009). Furthermore, Kang et al. (2011) suggest that typical errorless learning study should be involved in paired associate learning (p.49). For example, subjects in the control learning condition might be asked to guess the target after presenting the cue but before the correct target is presented. In errorless learning condition, learners do not have to guess, cue and the target were simply presented. On subsequent test, the performance of the errorless condition is sometimes found to be enhanced (Baddeley & Wilson 1994; Squires, Hunkin, & Parkin 1997). But, in case of verbal materials, incorrect guessing might be harmful (Jacoby & Hollingshead, 1990), that is, spelling errors impair on subsequent spelling performance.

Some studies suggest that unsuccessful retrieval in a test may impede learning. Marsh et al. (2007) pointed that if students make an error on multiple choice tests that error must be repeated in further test. Kornell et al. (2009) suggested that successful retrieval has strengthened the retrieval route, but sometimes it plays counterproductive effects on retrieval failure.

However, recent studies suggest that unsuccessful test actually plays a major role in enhancing future learning (Knight et al. 2012; Richland et al. 2009). But, research on unsuccessful retrieval is much less as compared to the rich work on successful retrieval (Grimaldi & Karpicke 2012; Knight et al. 2012; Kornell et al. 2009; Roediger & Butler 2011). Repeated studying produces short term benefit to the learner, whereas repeated testing produces long term benefits on learning.

MacLeod & Kampe (1996) suggested that word frequency had no effect on free recall. However, MacLeod (1989) suggested that word frequency effect would influence in both direct (recall, recognition) and indirect test (perceptual identification, word completion) in same way. Furthermore, MacLeod & Kampe (1996) suggested that there were different findings for between and within subject design on word pairs recalled. In between subject design, subjects recalled highly frequency words more than low-frequency words. In contrast in within subject design, word frequency effect on recall disappears, but low frequency words were more recalled than the high frequency words.

Most often error in testing predicts that there are inadequacies on the part of learners. However, many researchers suggest that committing an error and struggling to challenge it is an efficient way of learning (Izawa, 1970; Knight et al. 2012; Kornell et al. 2009; Richland et al. 2008). In addition, committing more errors during learning process is more beneficial on long term retention and transfer of that information.

Furthermore, Kornell et al. (2009) suggest that benefits of tests occur in both situations-under retrieval success as well as retrieval failure. Kane & Anderson indicated that unsuccessful retrieval has positive effect on learning when feedback is provided. Richland et al. (2008) suggest that the study of unsuccessful retrieval is important, for "all children have a fair, equal, and significant opportunity to obtain a high quality education and reach at a minimum, proficiency on challenging State academic achievement standards and state academic assessments". Therefore, no child is left behind from meaningful learning process. And, providing feedback after committing mistake is an effective way to correct those errors.

Bjork et al. (2013) suggested that if students were given a choice to restudy or to be tested those items; students will tend to select testing, especially for getting feedback. But, students tentatively used testing as a means of monitoring memory, not as a tool for improving their learning. Kornell & Bjork (2007) found that majority of students, that is, 70% were using test to figure out how much they have learned; and only 18% mentioned that they used testing because they learnt more from testing rather than rereading.

According to Kornell et al. (2009) testing material was better recalled at later time. Testing increases the efficiency on subsequent study and it decreases the level of forgetting. Kang et al. (2001) testing is more effective than restudy; under the testing condition learners are forced to guess a task, even if their response is incorrect also testing will facilitate on subsequent learning.

Past research suggests that people from weak educational background report themselves as more capable, especially in negative way. Their activity is more casting on investing in influencing others than the person who were from strong educational background. However, the persons from weak educational background are less concerned about negative self description than the persons from strong educational background (Gollwitzer & Wicklund 1985). Especially, in case of failure, the persons from weak educational background intentionally claimed that failure was because of their lack of ability in that area.

According to Gollwitzer & Wicklund (1985) symbolic interactionism is for considering human needs and valuing one's selfhood. If when we believe that those positive self-descriptions are symbols of fully functional persons, then those who have low profile or weak educational background would specially manifest their capacity and refuse from making negative self-description. People who are not performing well in their achievement levels; they would try to self report to others for motivating themselves. But, people who are strongly committed to one's self definition will strive towards the goals, no matter what types of feedback and obstacle they get.

Furthermore, an implicit theory of intelligence postulates that feedback of failure will be processed differently by different theory holders; that is entity and incremental theory holders. Unsuccessful retrieval itself is a feedback of failure. How this information is processed by different theory holders? How does this

belief about intelligence affect on subsequent learning? These questions are addressed in the following section.

2.2 Implicit Theories of Intelligence

People can come to different conclusions about their own nature as well as the nature of others. According to Sternberg (1999) no one is born with fixed level of intelligence, or creativity; however, these attributes are to be developed over time through experience and practice. People's belief about intelligence plays an important role on subsequent learning. The consequences of believing that fundamental human attributes are either fixed traits or malleable qualities are very important to becoming a person of success or failure. People can form different basic beliefs, which generally help them to guide and organize their behaviour. Weiner (1979) also suggested that attribution is the main basis of achievement motivation. Similarly, Hong et al. (1999) indicated that attribution could play mediator role to adopt an adaptive or maladaptive behaviour, when people face obstacles.

Implicit theories of intelligence mainly focus on individual's belief, how people judge about fixed or malleable ability of themselves and others. Entity theory believes that internal ability is fixed and stable in nature. It cannot be change by external factors like hard work and efforts. Whereas, incremental theory holders believe that one's ability can be changed through time, effort, and experience. So, this theory holders believes that intelligence is malleable and dynamic in nature

(Dweck et al. 1995; Elliot & Dweck 1988). The main generic difference between entity and incremental theory is that they do not view a given situation in a similar way (Dweck & Leggett 1988).

When they get negative feedback, incremental theory holders tend to persisting views rather than entity theory holders. If an incremental theory holder performs poorly in a test, they will tend to focus more on remedies, instead of highlighting their failures. In contrast, entity theory holders view that poor performance is because of their lack of ability, and they quickly shown helpless response. Diener & Dweck (1978, 1980) suggested that under failure condition children attributed failures in term of their lack of ability, but mastery oriented children were more concerned about remedies of the problem. They immediately developed new strategies to cope with the failures

Hong et al. (1999) mentioned that attribution can serve as the centre of motivation. It helps in coping with a situation. And they also pointed that there are two drawbacks of the attribution approach. First, motivational processes can occur only when people face failures. Second, they did not deal with a particular theory, like one's belief or one's conceptual framework, so that it can guide informing an attribution in a given situation.

Furthermore, implicit theories are linked to different goals and also with person's internal factors in explaining their performance. Entity theory holders tend to adopt more on performance goal, explain their negative performance in terms of

their lack of ability rather than effort. So, they show helpless response in failure condition. Whereas, incremental theory holders are more prone to adopt learning goals and believe that putting effort is a precursor of mastery over a task.

Incremental theory holder's view that the concept of personal attribution is for cultivating one's potential. These theory holders are more focused on effort and how to maximize their abilities. Under failure conditions, incremental theory holders are more focused on mastery oriented view, so that they can improve their ability as well as their performance. Entity theory holders highlight that poor performance is for their lack of ability, whereas incremental theory holders emphasize more on efforts. Mangels et al. (2006) suggested that students' beliefs and goals are closely related to their achievement. Burnette et al. (2012) indicated that people can endorse different implicit theories depending on the domain and situational context. If an educator believes on fixed mindset they do not tell or persuade their students to put more efforts to acquire mastery over a task. As a result, students don't put extra effort; therefore they find it difficult to achieve those higher goals (Dweck 2007).

Entity theory holders view that if a person requires effort it means they lack ability. Whereas, incremental theory believes that one's effort and ability are closely related. For them, ability is needed to cultivate one's potential to engage with effort. Hence, entity theory focuses more on lack of ability, and incremental theory is more focussed on malleability quality (Hong et al. 1999).

2.3 Implicit Theories of Intelligence linked with Unsuccessful Retrieval

Implicit theories of intelligence mainly focus on one's self belief. A person's self belief strongly depends on how they set their goal and guide their behaviour. Baumeister et al. (1993) pointed that success in life is making and keeping an appropriate commitment to the work. Difficulty level of a task is depending on what type of goal they set. Interestingly, they also pointed that over commitment to a goal increases mistakes than under commitment. Gollwitzer & Wicklund (1985) in their second study found that those who present themselves as more capable were more self-deprecating than those who had received negative personality feedback. However, the implicit theories of intelligence have not been used to analyze unsuccessful retrieval and its effect on subsequent learning. Using this theory to explain unsuccessful retrieval is important because there is no specific reason for failures, and how a person views a given context is very important to analyze one's success or failures.

Individuals who have high self esteem engage in risk taking behaviour. Sometimes such commitments make decision beyond their capabilities, thus, it may leads to failure. Subjects with high self-esteem are generally considered to be desirable and holding an adaptive state. Under normal and nonthreatening conditions, people with high self-esteem outperform those with low self-esteem. They know how to regulate themselves in a given situation, set an appropriate goal,

and perform it accordingly. However, people with high self-esteem end with ego threats when they set an inappropriate goal that exceeds their capabilities. Because of their high self-esteem they lead to overconfidence, overestimation about their self, so it may lead to subsequent failure (Baumeister et al. 1993).

There are quite a few researches which focus on effect of failure; it may be because of undermining the subsequent performances. In this field, some researchers are concerned with negative effect and others look at positive consequences. Negative effects of underperformance are caused by uncontrollable reasons. And repeated failures might produce motivational deficits to the learners and as a result they perform poorly (Brunstein & Gollwitzer, 1996). Those who attribute failures in terms of stable and fixed ability quickly respond to the helplessness pattern, whereas those who look at failures in terms of malleable and controllable traits are more focused on remedy. Therefore, we link implicit theories of intelligence with unsuccessful retrieval, so that these theories can explain better how individuals react to the same situations (i.e., entity & incremental theory holders).

Dweck & Leggett (1988) suggested that there are two main beliefs people hold about their intelligence; that is entity or incremental beliefs. Those who hold entity theory believe that one's ability is fixed or stable in nature. Most often entity theory is linked to performance goals. In contrast, incremental theory is the belief that one's ability should be malleable, and also controllable by an individual. And they

believe that one's ability can be improved through effort and experience. Hence, incremental theory holders prefer learning goals.

In case of failure, entity theory holders believe that, the reason of failure is because of their lack of ability. They are not interested to explore new tasks which they are not familiar with; they maintain their self-esteem and prevent themselves from making mistakes. Entity theory holders are evaluative in nature, they judge their ability. Thus, they easily divert from the difficult task, and show helplessness response. Whereas, incremental theory holders believe that feedback of failure is a great opportunity to improve their capability and correct their mistake. Therefore, they are willing to challenge the difficult task; as a result they gain mastery over a task.

Past research pointed out that if processing feels easy, people assume that their level of mastery is high, but if processing feels difficult to generate they simply assume that their mastery level is low (Dunlosky et al. 2006; Koriat 2008; Winkielman, Schwarz, Fazendeiro, & Reber 2003). If information is easily encoded (easily learnt) it is often indicated as successful remembering (better chance of being recalled later). It is the opposite of "easy comes, easy go" (Koriat 2008). The perception of feeling fluency is different for different implicit theories of intelligence (Miele & Molden 2010). Entity theory holders view low level of fluency as reaching the limit of their comprehension. In contrast, incremental theory holders do not view lower levels of comprehension as a sign of processing

fluency deficiency (Miele et al. 2011). In fact, they view effort as a precursor to mastery over a task.

2.4 How retrieval practices enhance learning?

There are high chances to make an error when we retrieve information from memory. Human memory is not similar to man-made devices; it cannot retrieve information in the same way like it had been stored (Bjork et al. 2013; Wickelgren 1981). Learners should engage in active learning process, so that their memory processes can improve. No matter, if their first attempt was failure. Active participation in learning helps students to understand the idea in depth, detail, and also connect to the new idea that related to the old one (Karpicke & Grimaldi 2012). Individual's learning style plays a major role to recall information, so learners have to understand their own pace of learning, for example, mass versus space learning.

Assessing of one's learning is very difficult because, most often we find that easy learning task easily fades away. That type of material often plays a counterproductive role in long term retention as well as transferring and connecting to the link in memory (Bjork et al. 2013; Koriat 2008). Materials which are difficult during learning process are better retained than easily encoded information. Learners make slow pace of learning and as a result their current performance is lowered. Wickelgren (1981) indicated that retrieval practice helps learners to become an effective learner, and that helps to make stronger memory

route. According to him, memory has two extreme states- one is in retrieved form, which is active in memory, and another is un-retrieved form, which is passive in memory.

Moreover, threats of a test often encourage students to study more. Mayer (2008) suggested that retrieval test promotes meaningful learning; this is the opposite of rote learning. Meaningful learning is the formation of information in well organize manner, it can links prior knowledge to present context, and in coherent, so that people can make inferences from that learning. In addition, Karpicke & Grimaldi (2012) suggest that learning is not a simple process which includes encoding, acquiring and elaborating learning. Retrieval plays an important role in learning, which helps to connect the prior experiences to the present context.

Grigorenko & Sternberg (1998) pointed that testing is not only the process of learning but it is a strategy to cultivate one's potential. They also suggested adopting dynamic testing in formal education rather than static one. Dynamic test is for measuring one's potential, and also providing feedback to the learners about how to cope with it. And static test is for measuring the set of abilities, levelling their knowledge to predict the subsequent cognitive development.

Chapter 3

Study

3.1 Overview of Study

Karpicke & Grimaldi (2012) suggested that retrieval practice is more than assessment of one's learning. Testing has more benefits than simply re-reading. The possible benefits of test are that it can enhance recall successfully at later time, retard forgetting and easily connect links between prior known information to the present information (Roediger & Karpicke 2006b; Nelson & Dunlosky 1991). However, there is less research conducted on unsuccessful retrieval. Research in this area has generated mixed results, that is, some research findings suggest that unsuccessful retrieval impedes learning, whereas others suggest that it enhances subsequent learning.

In the present study, we were intended to examine under which conditions unsuccessful retrieval can enhance subsequent learning? Our approach was to manipulate test-taking and read-only conditions with related and unrelated word-pairs. We wanted to analyze whether unsuccessful retrieval is a feedback of failure, and if so, how this feedback of failure is processed by different implicit theory holders of intelligence. We assumed that incremental theory holders will better perform in final recall in all the conditions.

Specifically, there are two reasons behind this (i) there is less research on the effect of unsuccessful retrieval on subsequent learning than the rich literature of successful retrieval, and (ii) how implicit theory of intelligence (i.e., entity and incremental theory holders) reacts to this feedback. From the review of literature it was clear that successful retrieval of a test material leads to improvements in subsequent learning. Successful retrieval of a test observably plays unique role in future learning by retarding forgetting, facilitating subsequent learning, transferring and strengthening the retrieval routes, etc. Retrieved information would become more recallable in future context rather than being left in the same state after reading (Bjork 1975).

Many researchers suggest that test taking is a means of active participation in learning (Bjork et al. 2013; Hays et al. 2012; Kang et al. 2011; Kornell et al. 2009; Richland et al. 2009; Roediger & Karpicke 2006). Committing an error during learning does not have detrimental effect on learning until it is corrected (Hays et al. 2012; Kornell et al. 2009; Metcalfe & Finn 2011). Otherwise, error will simply remain (Metcalfe & Kornell 2007). If errors are corrected through providing feedback, that information will be better retrieved than simply studying the correct answer from the beginning (Huelser & Metcalfe 2011). Another benefit of unsuccessful retrieval is that materials will play a mediator role and connect to the correct answer (Kornell et al. 2009).

Furthermore, implicit theories about human attributes organize and guide people's behaviours. It is very fascinating to note that different people can form

different basic beliefs. An entity theorist views one's ability as fixed and static in nature which cannot be changed too much. In contrast, those people who hold incremental theory believe that intelligence or ability is malleable in nature. It can be improved through effort, and they also believe that hard-work is the only way to acquire mastery over a task (Elliot & Dweck 1988; Hong et al. 1999; Dweck et al. 1995; Dweck & Leggett 1988).

Entity theory holders believe that difficulties and failures of a task indicate low ability. They believe that further effort is futile, thus, they divert putting efforts to the problems. Therefore, entity theory holders lack the will to learn challenging and difficult tasks. Incremental theory holders do not view difficult problems as an indicator of their lack of ability. Indeed, they view unsolved problems as challenges to be mastered through effort. Literature on implicit theories shows that entity and incremental theorists react differently to academic challenge.

Past studies on unsuccessful retrieval shows that it impedes subsequent learning (Guthrie 1952; Skinner 1958). However, few studies on unsuccessful retrieval show that it enhances subsequent learning (Hays et al. 2012; Kornell et al. 2009). There is ongoing debate on whether unsuccessful retrieval impedes or enhances learning. Little light has been thrown on why does unsuccessful retrieval enhance or impedes learning. The primary motivation to conduct this research was to bring more clarity to the debate; looking at different holders of implicit theory.

In this study, we conducted test on Secondary school students, participants ages ranging from 14-16 year old (i.e., adolescents). Prior research suggested that adolescence is the best time for testing because in this stage many changes are in progress. This stage is the transition period of biological, physical and psychological development. Some children find it difficult to cope with this stage, be it academic achievement or societal demands (Blackwell et al. 2007). Students' achievement performance differs according to their motivation.

Another reason to take secondary school students as the sample is that students regularly undertake various kinds of tests. In light of the above review of literature, we hypothesized that:

1) People holding incremental theory will show more subsequent learning to unsuccessful recall than the people holding entity theory.

2) Those who endorse incremental theory will be more effective at test taking condition than the read only condition. And,

3) Recall of unrelated word-pairs will be more for the students holding incremental theory than those holding entity theory.

Method

4.3 Participants

Seventy-five students participated in this study. Thirteen students were excluded for not following the instructions. Those who obtained neutral results in the implicit theory questionnaire were excluded from the study. The study was conducted on class IX and X students from a public school in Manipur. Their ages ranged from 14-16 years. Thus, sixty two subjects participated of which thirty two participants were identified as entity theory holders and thirty participants as incremental theory holders. An inclusion criterion was that they had the competence to comprehend written English.

4.4 Site of study

School where the present study was conducted was established in 1995. Total strength of students of school is 657. The school is a co-educational school, starting from class 1-10, and the pass percentage in class 10 in the last year was 89%. English is the medium of instruction in school. And the school location is approximately 40km from Imphal, the capital of Manipur.

4.5 **Measures**

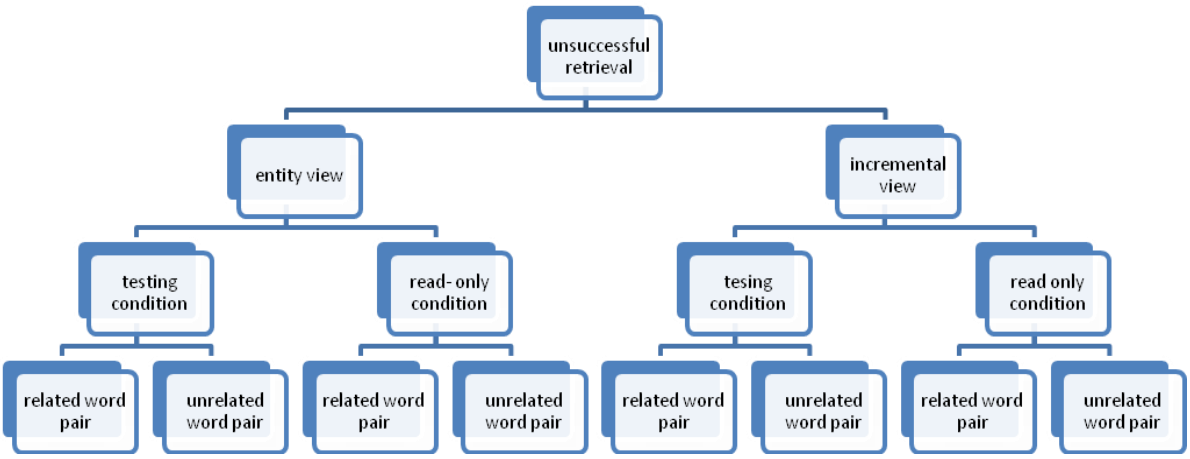
Implicit theories of intelligence measure were taken from Dweck, Chiu & Hong (1995a). This is a three item questionnaires which uses 5-point Likert scale

ranging from 1 (strongly agree) to 5 (strongly disagree). And it is predicted that those students' who score higher are under the category of incremental theory.

Nature of word pair measurement was taken from Nelson, McEvoy, and Schreiber's (1998). We took 60 word-pairs which included related and unrelated word pairs. For example, related word pairs like, frog-pond, star-night; and unrelated word pairs like, snow-monkey, lake-salute, etc.

4.6 Design

We used 2x2x2 mixed design, which included implicit theories (i.e., entity & incremental); condition (testing & reading); and nature of word pairs (related & unrelated), repeated on last two factors. Implicit theory was manipulated between the subjects; and the condition and nature of word pair was manipulated within the subjects. Thirty-two subjects participated as entity theorist and thirty subjects participated as incremental theorists.



4.7 Procedure

First, we greeted the subjects for participating, and we mentioned that this present study was supposed to find out whether unsuccessful retrieval enhances subsequent learning or deteriorates learning. Do one's self beliefs play an important role in subsequent learning? We also told them that there are four phases of this study. First, we instructed them to fill the implicit theories of intelligence questionnaire. We also explained about the questionnaire which we presented. And, we also suggested that, when subjects had completed this questionnaire we would give them feedback on what type of belief about intelligence they hold.

After that we were ready for the second set of questionnaire. We mentioned that if a student correctly responds in study phase he/she could be excluded from

further test. We briefly explained about the related word-pairs (e.g. student-campus; birthday-cake), and unrelated word-pairs (lake-salute; ice-cream-chapter). And, we also explained about the *test* and *read-only* condition. Before we started the second set of questionnaire we were all set with the stop watch to record the gap duration between words presented.

Thus, in the *read-only* condition we presented half of the related word-pairs, and half of the un-related word-pairs. And in the *test condition*, we presented remaining half of the related and un-related word pairs. Under the read-only condition we presented the cue and target word-pairs together for 5seccods; whereas, in the test condition we presented cue words for 8seconds, during which subjects were instructed to write the target-word. After that we presented the cue and target together for 5seconds. Therefore, we gave 5seconds for read only condition and testing conditions were 13 seconds long.

Third, we gave a 5minute break for distractor task. In this task we told them to write as many country names as possible. Final test followed the distractor task, under this condition we tested all word-pairs that is, related and un-related word-pairs. After all this process we thanked the subjects for participation.

4.8 Results

Sixty two subjects participated in this study. Participants' mean age was 14.54 and SD was 0.74. In this experiment we mainly focused on knowing the effect of unsuccessful retrieval on different implicit theory holders of intelligence under the conditions of testing and reading, and related and unrelated word-pairs. The design of study is 2 implicit theories (entity vs. incremental) X 2 conditions (testing vs. read only) X 2 nature of word pairs (related vs. unrelated) ANOVA, repeated on the last two factors. We found that our first hypothesis was not supported by the result. Table-3c showed that entity theory holders' mean recall was 9.03 and that of incremental theory holders was 9.25, there is no significant difference.

Secondly, we found that the interaction effect of implicit theories with condition is non-significant which is shown in table-2. Though few students who held incremental theory obtained more score at test-taking condition than the read only condition. And in test-taking condition the obtained mean is equal to 9.867, but in the read only condition the obtained mean is equal to 8.183, which is shown in table-4a.

Furthermore, we found that our last hypothesis was supported by our finding. It shows that there is moderately significant interaction effect of implicit theories with nature of word pairs at final recall. Those people who held incremental theory could better recall on un-related word pairs than the entity theory holders.

The mean value of the recall of unrelated word pair's for incremental theory holders and entity theory holders were 7.2 and 6.672 respectively, which is shown in table-4b.

As Table 1, shows that under the testing condition, related word-pairs were more recalled (i.e., entity theory holder, mean was 12.63 and SD was 2.21; incremental theory holder, mean was 11.83 and SD was 3.35) as compared to unrelated condition (entity theory holder, mean was 7.47, and SD was 2.55; incremental theory holder, mean was 7.9, and SD was 3.17). And, in the read only condition, related word pairs recalled were slightly higher than the unrelated word pairs. Under read only condition, mean of related word pairs recalled by entity theory holders mean was 10.16, and SD was 2.05; incremental theory holders mean was 9.87, and SD was 2.33. For the unrelated word pairs recalled by entity theory holders mean was 5.88, and SD was 2.73; for incremental theory holders, mean was 6.5, and SD was 2.93.

Between subject effects of implicit theories was found to be non-significant. This result indicates that if we ignore all other variables, the effect of entity theory holders were basically the same as the effect of incremental theory holders (i.e. there is no difference in effect of entity and incremental theory holders). Table 3c, shows the mean of implicit theory. It clearly shows that entity and incremental theory holders were same on recall.

However, in Table 2, we found that condition effect is significant, F (1, 60) =52.925, p<.001, which means there is different effect of testing and read only conditions on final recall. The research finding on interaction effect of condition and implicit theory is non-significant, F (1, 60) = .464, which means there is no different in influence of implicit theories on condition at time of recall (i.e., entity and incremental theory holders do not act differently). Again, the main effect of nature of word-pairs, F (1, 60) = 153.441, p<.001 is significant, which means there is a different effect of related and unrelated word pairs at final recall (table 3b, & 4b). Moreover, the interaction effect of nature of word-pairs and implicit theory is also significant, F (1, 60) =2.502, p=.119 and the interaction effect of condition and nature of word-pairs is significant, F (1, 60) =5.206, p=.026. This means there is different effect of condition and nature of word-pairs at final recall.

Finally, the overall interaction effect of three variables, that is, conditions (testing and reading), word pair (related and unrelated) and implicit theories (entity and incremental theory) on the final recall of the subject was found to be non-significant. Later on, we present the graphical representation of our findings in figures 1 and 2, which show the interaction effect. Based on these finding, it may be concluded that test taking is a tool that facilitates learning, and not only for checking how much the student has learnt of a material. The process of recall itself helps learning.

Table 1:

Descriptive Statistics of the test-related, test-unrelated, read-related, and read-unrelated

	Implicit theory	Mean	Std. deviation	N
TEST-RELATED	Entity	12.63	2.21	32
	Incremental	11.83	3.35	30
	Total	12.24	2.83	62
TEST-UNRELATED	Entity	7.47	2.55	32
	Incremental	7.9	3.17	30
	Total	7.68	2.85	62
READ-RELATED	Entity	10.16	2.05	32
	Incremental	9.87	2.33	30
	Total	10.02	2.18	62
READ-UNRELATED	Entity	5.88	2.73	32
	Incremental	6.5	2.93	30
	Total	6.18	2.83	62

Table 2:

Test of within subject and between subjects

Source	Type III sum of squares	DF	Mean square	F	Sig.
Implicit theory	.001	1	.001	.000	.990
Condition	213.648	1	213.648	52.925**	.000
Condition with Implicit Theories	1.874	1	1.874	.464	.498
Nature of word-pairs	1084.428	1	1084.428	153.441**	.000
Nature of word-pairs with implicit theories	17.686	1	17.686	2.502*	.119
Condition with Nature of word-pairs	8.045	1	8.045	5.206*	.026
Interaction effect of Condition, Nature of word-pairs, and Implicit theories	.368	1	.368	.238	.627

*Significant at .05 level
**Significant at.01 level

Table 3:

Mean, Std. error, Confidence intervals of a) Condition, b) Nature of word-pairs, and c) Implicit Theories

Source		**Mean**	**Std. Error**	**95% confidence interval**	
				Lower bound	**Upper bound**
Condition	**Test**	9.957	.318	9.320	10.594
	2 Read	8.099	.251	7.597	8.602
Nature of word-pairs	**Related**	11.120	.286	10.547	11.693
	Unrelated	6.936	.327	6.282	7.59
Implicit Theories		**Mean**	**Std. Error**	**95% confidence interval**	
				Lower bound	**Upper bound**
Entity		9.031	.357	8.317	9.746
Incremental		9.025	.369	8.287	9.763

Table 4:

Mean, Std. error and, confidence intervals of a) Implicit theories*Conditions, and b) Implicit theories*Nature of word-pairs

a) Implicit theory	**Conditions**	**Mean**	**Std. Error**	**95% confidence interval**	
				Lower bound	**Upper bound**
Entity	Test	10.047	.443	9.161	10.933
	Read	8.016	.349	7.317	8.715
Incremental	Test	9.867	.457	8.952	10.782
	Read	8.183	.361	7.461	8.905
b) Implicit theory	**Nature of word pairs**	**Mean**	**Std. Error**	**95% confidence interval**	
				Lower bound	**Upper bound**
Entity	Related	11.391	.399	10.593	12.188
	Unrelated	6.672	.455	5.762	7.582
Incremental	Related	10.850	.412	10.027	11.673
	Unrelated	7.2	.470	6.260	8.140

Graphical representation of Condition, Nature of word-pairs, and Implicit theories

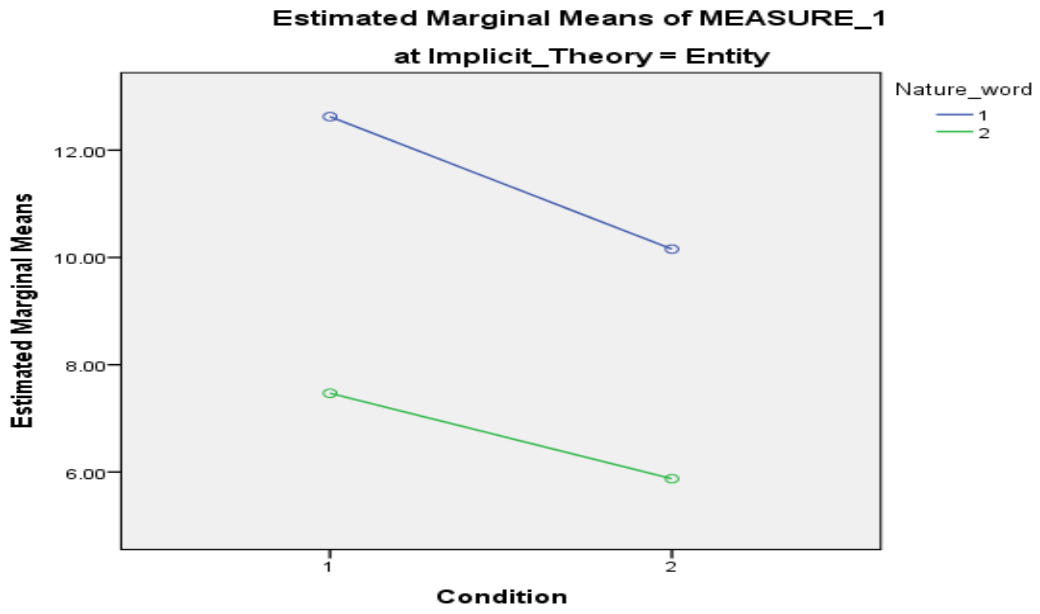


Figure 1. Shows the graphical representation of entity theory with conditions and nature of word-pairs.

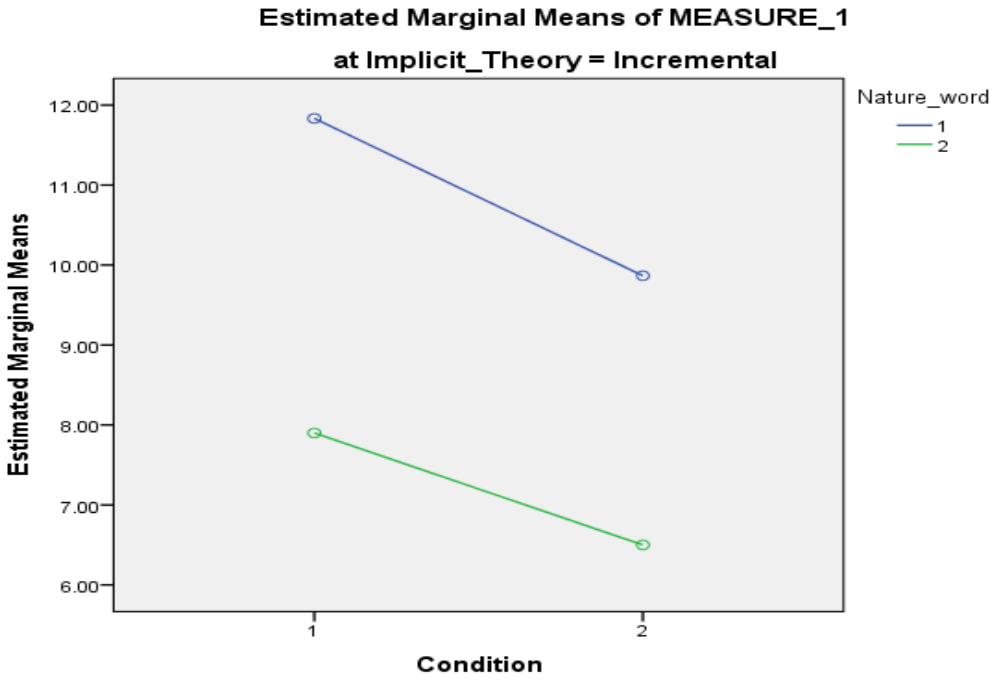


Figure 2. Shows the graphical representation of incremental theory with conditions and nature of word-pairs.

Chapter 4

Discussion

Numerous researches have pointed that test taking enhances the recall of materials (Bjork et al. 2013; Carpenter et al. 2008; Roediger & Karpicke 2006). It has also been mentioned that most of the students use test for evaluation purpose only, not considering testing as a method for enhancing learning. Our findings are replicating the findings of Kornell et al. (2009) that unsuccessful retrieval enhances subsequent learning. In the present study we found that test taking helped recall better than reading. This finding is supported by prior study done by Hogan & Kintsch (1971) where they found that testing strategies are more effective than the read only practices. Butler & Roediger (2007) suggested that tested material were better memorised as compared to restudying material.

Roediger & Karpicke (2006) suggested that testing is misguided in formal education by accepting it only for evaluation. If students know they will be tested regularly, they will study more rather than concentrating just before the final exam or end of the semester (Bangert-Drowns, Kulik, Kulik 1991; Leeming 2002). Active participation during learning, that is testing has larger effects on learning than simply re-reading a material (Karpicke & Roediger, 2010). Grimaldi & Karpicke (2012) also suggested that pretested items were better recalled than the studied items at final cued recall test.

From these findings, it can be said that our data do not support the first hypothesis. That is, people holding incremental theory cannot show more recall than the entity theory in failure condition. As far as the second hypothesis is concerned, incremental theory holders did not show significant result on test taking condition than the read only condition. However, incremental theory holders performed slightly better at test taking condition than the read only condition. It revealed that one's beliefs about intelligence in failure condition regarding testing and reading effect are because of lack of their ability. In addition, entity and incremental theory holders performed differently on retrieval test. Later on, nature of word pair's condition found that related word-pairs are better recalled than unrelated word pairs. Blunt & Karpicke (2014) suggest that practicing retrieval enhanced learning, whether the material is in paragraph format or in concept mapping format.

Past study on paired associate learning provided two conditions to the subjects. One was control learning condition, in which they presented cue to the subjects and asked to guess the target before they presented the correct answer. Second, in errorless learning condition, learners did not have to guess, they were simply presented the cue and the correct target. On a subsequent test, it was found that performance is sometimes enhanced by training in the errorless condition (Kang et al. 2011).

Bandura et al. (1996) pointed that person self-efficacy is directly related to the effort they have dedicated to a task. In case of failure, those who have high self-

efficacy are more focused on their work, persist to a task, as a result they can succeed in their academic work than the low self efficacy holders. Kang et al. (2011) suggested that those who have high confidence better recalled on final test, this effect are termed as hypercorrection. And our research finding does not clearly show that there was significant effect between different theory holders. Hence, both theory holders tried to retrieve given word pairs at their best level.

Prior research mentioned that when people with high confidence get negative feedback, they really focus to learn the correct answer because it is something unexpected for them (Butterfield & Metcalfe 2006; Fazio & Marsh 2009; Metcalfe & Finn 2011). Furthermore, Kang et al. (2011) also suggested that students do not need to be discouraged even if their responses were incorrect, spontaneous guessing may indicate a higher state of learning than withholding of a response (p.57).

Gollwitzer & Wicklund (1985) suggest that female professionals who had received negative personality feedback tended to report positive self-description than those who had received positive personality feedback. However, in further conditions when asked about their competence as potential mothers no such differences were found between positive and negative feedback holders. According to Brunstein & Gollwitzer (1996) successful goal persuasion is meant for coping with a failure task effectively.

Furthermore, we found that our last hypothesis was supported by our result; incremental theory holders recall more in unrelated word-pairs than the entity theory holders. It means that after receiving negative feedback on failure incremental theory holders tried even harder to adapt and cope with that task. Thus, incremental theory holders quickly adopted learning goals and tried to retrieve as many word pairs to the best of their ability. In contrast, after getting negative feedback entity theory holders believed that their weak performance is because of their lack of ability. They quickly adopt performance goals, so they avoided risk taking and had low persistence in the given situation. Hence, they quickly showed helpless response in the given task. Gollwitzer & Wicklund (1985) in their first experiment found that subjects who were given negative personality feedback tended to approach competitiveness.

Prior research on implicit theories suggested that those who believed in fixed ability were more prone to behave in self handicapping behaviour rather than incremental theory holders. Entity theory holders believed that judging one's ability is more important than one's success (Dweck & Leggett 1988; Hong et al. 1999; Rhodewalt 1994). In addition, experiences of processing fluency are almost always interpreted positively in the context of learning. If processing feels easy, people assume that their mastery level of learning is high, but if processing feels difficult, people assume their mastery level is low (Dunlosky et al. 2006; Koriat 2008; Winkielman et al. 2003).

Research on judgments of learning has constantly supported that ease of processing learning. And also it has been demonstrated that the heuristics people use to infer their experiences of processing fluency can be intensely influenced by their naive theories about what these experiences mean for them (Labroo & Kim 2009; Schwarz 2004; Thomas & Morwitz 2009; Winkielman & Schwarz 2001). Processing fluency is almost always interpreted positively in the context of learning (Dunlosky et al. 2006; Koriat 2008). Most often students' beliefs about testing are misinterpreted; they view testing as an evaluative means only.

Kornell & Bjork (2007) aimed to examine why students use self-testing, they found that minimum number of participants (i.e., only 18%) indicated that they used self- testing because it enhances learning more than the simply re-reading, but maximum numbers of participants (i.e., 70%) responded that they used self testing for assessment of their learning. Bjork et al. (2013) suggest that the capacity of human memory for storing information is essentially unlimited (p.420). Retrieving information is constructive and inferential in nature due to person's experience, expectation and situational factors. Thus, learners have to adopt learning goals, and develop effective strategies. There is no unique learning style that helps a person to become an effective learner.

Baumeister et al. (1993) in their study on ego threats to self-regulation suggested that people with high self-esteem are quite effective, appropriate in self-management, have impressive capacity to deal with appropriate goals, hence they make outstanding performances. However, under ego threatening condition they

almost cease to think rationally, and also ill-manage their performance. In this situation, they are more concerned with saving face of their excellence (Baumeister 1982). Furthermore, they increase their speed of accuracy for using favourable self-image to make good performance, but the result was counterproductive, which may cause poor performance.

Furthermore, testing is an effective strategy for improving learning; it prevents forgetting, enhances long-term retention, and also provides feedback through testing. Testing identifies the weak areas of learners and guides to make new strategies for future direction accordingly. And, after the final test of our study we had asked the participants what types of learning better helped them in recalling the final test. Thirty-nine participants out of sixty-two answered that testing helped to recall more than the read only condition.

Subject responses in final recall were much better than in the initial study phase. Guthrie (1942) stated that people learn only by doing, "A student does not learn what was in a lecture or in a book. He learns only what the lecture or book caused him to do" (p.55). Bjork et al. (2013) and McCabe (2011) suggested that student's beliefs about test play an important role in making effective learning strategy. Most often students do not believe that testing is a more effective strategy than rereading. Our result supports the prior research that unsuccessful retrieval enhances subsequent learning.

4.1 Contribution of the present research

In the field of social psychology, we respect the unique differences of people, their beliefs, and their values. First, this research work is an initial step which links together one' self belief about intelligence and the role of retrieval in learning. What would be the significant effect that different theory holders have on subsequent learning under unsuccessful retrieval condition? Empirical finding of this research suggested that entity and incremental theory holders would react differently in case of failure. There is no significant difference as compared to reading versus testing condition on implicit theories. This research also explains that the role of testing on subsequent learning, that is, retrieval process is making stronger the route of information. In addition, unsuccessful retrieval plays mediating role to connect the true answer (word-pairs).

Second, the present findings provide support to the prior finding that unsuccessful retrieval enhances subsequent learning (Hays et al. 2012; Huelser & Metcalfe 2011; Karpicke & Grimaldi 2012; Kornell et al. 2009). Forced guessing of an answer neither benefits nor harms learning with comparison to free responding (Metcalfe & Kornell 2007). Furthermore, these findings are relevant for understanding the effect of reading versus testing in future context. And, individual's implicit theories of intelligence differently guide how to cope with subsequent learning.

Furthermore, providing feedback after committing an error is an effective way to handle an error. Most often people do not believe that test taking enhances learning better than simply reading. Testing strengthens the memory route rather than mere repeated study of same materials on several occasssions (e.g., Bjork et al. 2013; Carpenter et al. 2008; Cull 2000; Karpicke & Grimaldi 2012; Roediger & Karpicke 2006a, 2006b). Most often in formal education, test is used only for the main purpose of evaluation (Karpicke & Grimaldi 2012). Grigorenko & Sternberg (1998) argued that dynamic testing approach should be adopted in formal education. Benefit of testing cannot be limited to the product of learning, but, testing is means for cultivating one's potential to learn. Therefore researchers, educators, trainers, and policy maker should develop testing as a learning event. Test is not only for assessment process.

4.2 Practical Implication

Human learning and memory are characterized by storage and retrieval processes. But, we cannot recall information in the literally recorded format like manmade devices do (Bjork & Bjork 1992; Bjork et al. 2013; Karpicke & Grimaldi 2012). Advantage of pretesting text in learning is attributed to increase in curiosity about the answer (Berlyne 1954a, 1954b). Wrong guesses do not hurt acquisition of the correct information as long as feedback is provided immediately after the errors (Hays et al. 2012; Kang et al. 2011) because it leads to depth processing of the correct answer.

Benefit of test occurs under both successful retrieval as well as unsuccessful retrieval, but sometimes it plays a counterproductive role when retrieval strengthens the wrong route. In this current study, subjects were clearly aware that the response they had given in the test contained errors. Because, the cue and target word-pairs were not closely related (i.e., thirty word-pairs were weakly associated materials and another thirty word-pairs were totally un-related materials).

We also found that subjects made more responses at final recall after they had committed error. This study brings out the negative belief about test clearly. Our findings suggest that feedback is essential to rectify an error; learners should introduce a challenging view in failure condition so that they can adopt learning goals. Under failure condition, learners need to have positive hope and direction

for perform better. Praising of learners increases more effort, but they have lack of skills (Baumeister et al. 1990). People who are more focused on self-evaluation (i.e., entity theory) are more willing to put pressure on themselves in failure condition. As a result they may perform poorly.

Active participation in learning is beneficial in many ways; it can improve memory functioning, self confidence, and develop new ideas related to that information. How will it be possible to become an active participation in learning? Teachers and learners have to develop mutual understanding about the value of learning, and also develop the new strategy to enhance learning from time to time. Teachers should motivate learners, so that learners can use their potentials to become effective and as a result they achieve higher goals.

What are the remedies to cope with failures in education? Schools and Colleges should develop programs like "*know themselves program*" so that learners can be aware of their weakness, set appropriate goals, be self dependent, develop strategies, and manage their time form the beginning, without any hindrance of their educational career. Introducing this program is not for stigmatizing those learners. Those students who poorly perform in a task need motivation and need to put more extra effort to perform better. Considering the matter schools, colleges have to allow extra facility for those students. For example, option of providing extra semester, so that they can use that feedback of failures in useful way, and develop new strategies, using their potential to cope with obstacle and improve their learning. It might be a practical solution instead of

expelling them from the institution. Through this process we can achieve the goal of "*Quality of Education*" with inclusiveness without compromising the expected quality of education.

Prior research on "*Dynamic Testing"* suggested that testing should be measured on individual strength and weakness in cognitive skills with learning potentials (Grigorenko & Sternberg 1998; Roediger & Karpicke 2006; Sternberg 1999). Dynamic testing is a type of test that promotes learning, but which merely assesses cognitive learning. Sternberg et al. (2002) indicated that dynamic test is a test which is followed by feedback of the initial test, and gives a second chance to improve performance, so that learner can improve their scores.

4.3 Limitation and Direction for future research

States like Manipur are facing shrinkage of resources; technology, transportation and military problems are the major issues of the youth. I found that some participants faced problems with words used in this research. They were not familiar with those words. For example, words like sea, beach, train, caboose, whale, snow, etc. After conducting the experiment I shared and explain the basic idea about intelligence, memory, and also motivated them.

Because of limited time we didn't check the effect of group identity formation that is the effect of in-group and out-group effect. People who hold entity theory for them incremental theory holders are out-group and vice versa. So, further research can focus on it.

One more limitation is that both read-only and testing condition have different time period. That is, testing condition (i.e., 13-sec.) subjects have much more time than the read only condition (5-sec.). But, our result shows that unsuccessful retrieval enhances subsequent learning, and feedback is essential for correcting error. However, there are incongruent interaction results in conditions and implicit theories of intelligence. But, for the interaction effect of nature of word-pairs with implicit theories of intelligence we found significant effect in final recall.

Therefore, future research should focus on

1) Test is a learning event not only for evaluating means.

2) Test taking enhances learning rather than the re-reading on subsequent test.

3) Unsuccessful retrieval enhances learning when feedback is provided.

4) Study on unsuccessful retrieval is important because students have a chance to improve learning. So, no child is left behind from meaningful learning processes.

5) Learners and educators should introduce challenging situation during learning process. So that learners can improve their performance.

4.4 Conclusion

The main goal of this dissertation was to examine the impact of implicit theories on unsuccessful retrieval. Results of this study did not show any major difference in findings of implicit theories of intelligence on recall. However, we found a significant interaction effect of implicit theories and the nature of word-pairs on recall. Therefore, it may be concluded that the process of recall itself helps learning, whether students held entity or incremental theory.

Generally, entity theory holders were high achievers. And, at the same time they viewed themselves as superior to their batch mates, and also looked at themselves as successful persons. They choose appropriate goals related to their abilities. And they manage situations under their favourable condition, but it plays counterproductive role in ego threatening condition. Baumeister et al. (1993) indicated that people with high self-esteem were generally expected to succeed in any condition, so that they pay little attention to risk taking situation, and finally may lead to potential failure. But in contrast, people who make positive illusion, positive self-images are more prone to adaptation; they can set appropriate goal and self-regulation (Bandura 1989).

Poor performance is not only about motivational deficit, but it is also a lack of functionality. Self beliefs play an important role to becoming successful, but in case of failures a person has lost their self belief, thus they depend on external factors. They developed inappropriate goals, and after all, success is meaningless

for them. Remedies for failure are to set an appropriate goal, be self dependent, efficient in time-management and self-regulation. Hence, students have to focus more on remedy of the problem rather than casting self-aggrandizing in front of others. So, they keep focus on goal, and are willing to persist until the main goal has been achieved. The main argument of this paper is that failure is not the end of the route of learning. Learner needs to fight failure with positive hope, effective strategy, so that it will help to achieve the goal. And testing is not only a product of learning, but it is a potential to learn (Grigorenko & Sternberg 1998).

Our finding supported the prior work, that unsuccessful retrieval enhances learning, and false materials also play a mediating role in final recall (Kornell et al. 2009; Grimaldi & Karpicke 2012). But, there is no different impact of implicit theories of intelligence on recall (i.e., entity and incremental theory). Furthermore, the interaction effect of implicit theories with conditions was also found to be non-significant. However, students who held entity or incremental theory scored slightly more in test-taking conditions than in the read-only conditions. Blunt & Karpicke (2014) suggested that promoting meaningful learning is not the matter of the format of activity. The main purpose is to engage in active retrieval practice during learning (p.857).

Therefore, this finding suggests that testing is an important source of meaningful learning, whether the retrieval is successful or not. Most often teachers or educators are reluctant to give test as a learning event because of the fear of incorrect responses.

Thus, taking a test or examination is a tool of facilitating learning, not only for evaluating purpose. A few researches have been done to look into this aspect. Hence, much more researches are needed to support this argument.

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Appendix-A

Consent Form

Purpose of the study:

Present research will focus on the circumstances where unsuccessful retrieval attempts to enhance or impede subsequent learning. Unsuccessful retrieval is a feedback of failure, how this information is processed by implicit theories holders. That is, entity and incremental theory holders react to this feedback of failure and what is the impact on subsequent learning. One of the inclusion criterions will be that they have competence to comprehend written English. Test will be less than 30 minutes.

Description of Procedure:

Regarding this research we will conduct four stages of experiment. First, we will test participant's implicit theories of intelligence i.e. fixed or malleable believe about intelligence. And in the study phase, we will give two conditions that is test and read only conditions, which contained sixty word-pairs. Thirty word-pairs were related (e.g., kite-wind) and another thirty were unrelated word-pairs (e.g., lake-salute). After that distractor task will be follow, we will give 5min to write as many as country name. Finally, there was cued recall test of all of the word-pairs (i.e., which is including the read and testing condition). Following the final test, participants made a judgment of their performance at final test on the basis of *test or read-only* conditions (√).

Confidentiality:

All data will be remaining confidential and its use for research purpose only.

Benefits of study:

The present study will not directly benefit to the participants; however, data collected from the study will be used to gain and better understanding the effect of learning and memory.

Decision to participation in this study is your choice:

You can decide whether you want to take part of the study, or you can leave question. And you may exit from this research study at any time.

Consent:

If you want to participate in this study, you have to fill up the below consent.

Name:……

Age:……....., Gender:……..…..……..,

Class:……

School:……

Contact Information

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Appendix-B
Assessment of Implicit Theories of Intelligence

Name:……
Class:…… Age:……..
Gender:…….
School……

All items are 5-point Likert scale. Please be true in your response. There is no right or wrong answers.

1)"You have a certain amount of intelligence and you really can't do much to change it";

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

2)"Your intelligence is something about you that you can't change very much";

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

3) "You can learn new things, but you can't really change your basic intelligence."

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

Appendix-C

STUDY-PHASE

READ-ONLY CONDITIONED

RELATED WORD-PAIRS:

SKYSCRAPER	**TOWER**
MOUSE	**HOLE**
CABLE	**TELEVISION**
BIRTHDAY	**CAKE**
CALCIUM	**TEETH**
FISH	**FRY**
ROYALTY	**PALACE**
STETHOSCOPE	**DOCTOR**
CALORIE	**DIET**
SUMMER	**CAMP**
POLITICS	**CAMPAIGN**
STUDENT	**CAMPUS**
SLOPE	**MOUNTAIN**
ACTIVE	**SPORT**
SMART	**BRIGHT**

UNRELATED WORD-PAIRS:

FACTORY	**PLANT**
SOUND	**YELLOW**
BOOK	**MONEY**
COFFEE	**PICASSO**
HOLIDAY	**DROP**
FLOOD	**VOTE**
BELIEF	**OCEAN**
DEER	**SUCCESS**
WORD	**MUSCLE**
BUTTERFLY	**HAPPY**
JUNGLE	**PATROL**
FIELD	**PIZZA**
MEADOW	**FLAG**
WATCH	**NOTE**
GAME	**MUSIC**

TEST CONDITIONED

RELATED WORD-PAIRS:

TIDE……..?	**(BEACH)**
JELLY……..?	**(BREAD)**
KITE…….?	**(WIND)**
STAR……?	**(NIGHT)**
FOOTBALL…….?	**(PLAY)**
FRECKLE……...?	**(MOLE)**
BASKET……..?	**(FLOWER)**
TRAIN…….?	**(CABOOSE)**
FROG……..?	**(POND)**
WHALE……?	**(MAMMAL)**
SWING……?	**(TREE)**
TOGETHER……?	**(LOVE)**
CABBAGE……?	**(GREEN)**
EMOTION……?	**(MOOD)**
GEOMETRY…….?	**(ANGLE)**

UNRELATED WORD-PAIRS:

STEM…….?	**(CANDY)**
PILLOW……?	**(LEAF)**
SPRAY……..?	**(BONE)**
COMPUTER…….?	**(LADDER)**
CALENDER…….?	**(NEWSPAPER)**
LIVER.....?	**(JUDGMENT)**
ICE-CREAM.....?	**(CHAPTER)**
HEADACHE…….?	**(CARTOON)**
DAIRY……..……?	**(ROSE)**
BROWN……..…?	**(PRAISE)**
LAKE……..?	**(SALUTE)**
TABLE……..…….?	**(CARPET)**
SNOW…….?	**(MONKEY)**
MOON……....?	**(DISNEY)**
UMPIRE…….?	**(TIME)**

Appendix-D

FINAL TEST

Name:…….

Class:…… Age:……..……Gender:……

TIDE……?	**STEM……?**
JELLY…….?	**PILLOW……..?**
KITE……?	**SPRAY…….?**
STAR……?	**COMPUTER……?**
FOOTBALL…….?	**CALENDER……?**
FRECKLE……?	**LIVER……..?**
TRAIN…….....?	**ICE-CREAM…….?**
FROG…….?	**HEADACHE…….?**
WHALE…….?	**DAIRY……?**
SWING……..?	**BROWN…….?**
TOGETHER…….?	**LAKE…….?**
CABBAGE……?	**TABLE……?**
EMOTION……?	**SNOW……..?**
GEOMTRY……..?	**MOON……..?**
CABLE……?	**UMPIRE…….?**
BIRTHDAY……....?	**FACTORY…….?**
CALCIUM……..?	**SOUND……?**

QUIET…….?	**WORD…….?**
ROYALTY…….?	**BUTTERFLY……..?**
STETHOSCOPE…….?	**JUNGLE……..?**
CALORIE…….?	**BELIEF…….?**
CAMERA…….?	**HOLIDAY…….?**
SUMMER……..?	**FLOOD……..?**
POLITICS…….?	**COFFEE……?**
CAMPUS…….…...?	**BOOK…….?**
SKY-SCRAPER…….?	**DEER……..?**
MOUSE……?	**WATCH……..?**
FISH…….?	**GAME…….?**
SMART……?	**FIELD……..?**
BASKET…….?	**MEADOW……?**

Judgment of their performance (Tick √)

- **Which condition helped you to recall more word pairs at final test? (Read only or Test conditioned)**