

## **EFFECTS OF STUDY STRATEGY AND LEVELS OF FLOW ON RECALL AND RECOGNITION AMONG SECONDARY SCHOOL STUDENTS**

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**ABSTRACT:** This study investigated the effect of study strategy and levels of flow on recall and recognition of secondary school student. The study aimed at determining the type of study strategy that ensures a better performance in memory retrieval processes of recall and recognition. This study employed a 4x2 factorial design to investigate effects of study strategy and levels of flow on recall and recognition among eighty students from senior secondary school (SSS) two aged between 11-20 years ( $M = 16.5$  years). The participants comprise of 43 males and 37 females. Mefoh's (2010) "The Last Search" was used as stimulus material while recall and recognition was measured using oral prose assessment test (OPAT) I and II respectively. Wolf study-related inventory was used to measure levels of flow. Multivariate analysis of variance (MANOVA) result revealed significant main effects of study strategy on recall  $F(3, 5.04) = 90.76, P < .01$  but not on recognition. Statistical significant differences existed for participants in both the shallow ( $F(1, 110.04) = 6.11, P < .05$ ) and intense ( $F(1, 239.07) = 15.87, P < .01$ ) flow levels in the study. The study affirmed that the reread study method is easier for learners and that the various study strategies investigated do not show the same performance on recall and recognition exercises. As challenges the students' normal lesson periods was interfered with and the sample used were draw from only a private school. Thus, these researchers recommend that a more controlled study be conducted by first identifying students who study more with a particular method and test them separately. The resultant outcome of the investigation will permit for a stronger comparison and inferences. Also, the replication should be done with public school students on one hand and a mixed sample on another.

**Keywords:** Recall; Recognition; Study Techniques; Flow Level; Students

### **INTRODUCTION**

The purpose of learning is to acquire knowledge that stays with the learner long after the time it was acquired. Being able to retrieve what one experienced (learned) help humans to relate sufficiently to the past (immediate or distant) and the present for better adaptation and response to events. Memory retrieval is more or less automatic process but distraction at the time of retention may slow down the retrieval process to some extent, it typically has little or no effect on the accuracy of retrieved memories but can severely impair subsequent retrieval success (Matsin, 2019). It is recorded by Kahana and Miller (2011) that the dynamics in memory retrieval is influenced by certain phenomena that guide how people search stored information in the memory and they include the effect of: recency, primacy, contiguity, forward asymmetry and semantic proximity.

Along with encoding and storage, retrieval is one of the three core processes of memory, noting that recall and recognition are retrieval tasks (Spencer & Pillay, 2005). Matsin (2019) and Cohen, Rissman, Hovhannisyanyan, Castel and Knowlton (2017) posit that recall of has to do with the subsequent re-accessing of events or information from the past, previously encoded and stored in the brain without a cue. Recall is the perception placed in long-term storage, requiring a higher depth processing, at times, one hardly remembers how the information got into the head. Recall exercises may involve any of remembering the name of a recognized person, fill-in the blank questions, etc. During recall, the brain replays a pattern of neural activity that was originally generated in response to a particular event, echoing the brain's perception of the real event (Srivastava & Vul, 2017). Recall has been theorized as a two-process retrieval task, where a cue is first recognised, without prompting or the original stimuli present (Clariana & Lee, 2001).

Matsin (2019) holds that recognition is a response to a sensory cue. When people see something, they compare it to information stored in their memory, if a match exists, recognition occurs. Recognition is association of events or objects with ones previously experience or encounter, and involves a process of comparison of information with memory, e.g. recognizing a known face, true/false, the delayed match-to-sample and the forced choice recognition memory tasks or multiple choice questions, etc, portraying recognition as a largely unconscious process (Stern & Hasselmo, 2009). Spencer and Pillay (2005) presents recognition as a declarative knowledge outcome theorised as a single process, by showing that recognition tasks could include matching items where alternative options are presented and the correct response is selected.

In comparing recall and recognition, scholars (Spencer & Pillay, 2005; Clarian & Lee, 2001) found that recognition tests have better retrieval than recall tests, implying that recognition is easier than recall. Imagine walking down the street and meeting someone encountered in the past, there is this feeling that you have met the person before but cannot remember his/her name. The first thing is recognition, followed by recall, indicating that people use a combination of recall and recognition in daily memory retrieval (Tarnow, 2015; Abdel-Mouttalib, 2015; Murray, 2001). The big difference between recognition and recall is the amount of cues that can help memory retrieval; recall involves fewer cues than recognition (Srivastava & Vul, 2017). Answering a question such as did Chinua Achebe write "There Was a Country?" involves recognition, you simply have to recognize whether the information provided is correct. If instead asked, who wrote "There Was a Country?" You are expected to retrieve (recall) the right answers from your memory. It must be noted that organization improves recall but has little effect on recognition and that recognition can occur without recall but not otherwise permitting errors to occur any memory store which is backed by the encoding specific theory (Parente, St. Pierre & Chaney, 2016; Ma, Hussain & Bays, 2014).

Shernoff and Csikszentmihayil (2009) believe that a relationship exists among study strategy, levels of flow and cognitive processes of recall and recognition. Success of students in learning depends on the effort they put into their study to obtain the highest possible grades by adopting well organised and efficient study methods (Ertmer & Newby, 1996; Entwistle, 1992). Teachers counsellors and parents can help students to better regulate their learning through by using effective learning techniques suggested by Dunlosky, Rawson, Marsh, Nathan and Willingham (2013). Although the techniques have their advantages with the most widely used learning strategy by students (Sara, 2015; Dunlosky et al. 2013) being the "reread" technique but Callender and McDaniel (2009) saw that rereading was ineffective, so

instead, students should study to actively process the content of the material by exploring the efficacy of other techniques.

The pontifications of Callender and McDaniel (2009) give impetus to scholars (Klemm 2016; Soderstrom, Kerr & Bjork, 2016; Karpicke & Roediger, 2008) who opine that many students do not study effectively and the one aspect of studying that is often undervalued is the way students test themselves to see how much they have learned. Therefore, students are expected to identify and use the best technique that ensures their effective encoding of study materials for optimum retrieval of same either by recall or recognition exercises. The crop students which identify and adapt a suitable study technique for optimal performance are described by Ertmer and Newby (1996) as expert learners. These expert learners approach academic tasks with confidence, diligence, and resourcefulness. The ability to implement appropriate regulatory strategies when they become aware that certain facts or skills are missing from their learning patterns that are necessary for reaching desired academic goals make such learner an expert. Students' knowledge of academic task and their perception of themselves as learners influence their judgments and beliefs about their personal learning which, in turn, affects the choice of strategies and the effort they expend in school. Studies of Cohen, Knowlton, Castel, Hovhannisyan, and Rissman, (2017) among others (Brown, Goodman, Ryan, & Analayo, 2016; Kornel, Klein, & Rawson, 2014; Sheridan & Reingold, 2012; Pyc & Rawson, 2012) suggest that study strategy significantly affects the retrieval tasks of recall and recognition among learners.

Level of flow is another factor that affects memory retrieval. Mirlohi, Egbert and Ghonsooly (2011) and Csikszentmihalyi (1970) represented flow as optimal experience, an experiential state characterized by an individual's intense focus, control, interest and also by a skills-challenge balance that leads to enhanced performance on a tasks, provides basis for peak performance and reaching one's peak, and encourages exploratory and investigative behaviours as well as activity repetition. Flow (Csikszentmihalyi, 1990) is seen as a highly enjoyable state people feel when they are completely absorbed in an activity, be it mental or physical task. Flow has been assessed in many other dimensions with few studies conducted in academic studies domain. Study-related flow is defined as a short-term peak experience during study activities characterised by absorption, study enjoyment, and intrinsic motivation for these activities (Bakker, Golub & Rijavec, 2017). Perhaps the most central condition for flow experiences to occur is that the challenge of the activity is well matched to the individual's skills.

The theory of flow is inherently related to learning and has been found to have mediating association with learning to yield high self-efficacy in games and other manual activities (Shernoff & Csikszentmihalyi, 2009) but there is a dearth of evidence on how flow can affects students' recall and recognition performance of studying materials (Bakker *et al.* 2017). The flow seems elusive and unattainable initially but entirely very possible for everyone to reach following the procedural steps provided by Borgers (2019) leading to unconscious lose in time due to the calm full focus on the task which becomes less labourious and more pleasant with the feeling of confident satisfaction and mastery of the material (Bakker, Golub & Rijavec, 2017; Shernoff & Csikszentmihalyi, 2009). Study by several scholars (Amini, Ayari & Amini 2016; Hidalgo, Pulpulos, Puig-Perez, Espin, Gomez-Amorand & Salvador, 2015; Robinson & Rollings, 2010; Dudukovic, DuBruw, & Wagner, 2009; Foos & Goolkasian, 2008; Barbosa & Albuquerque, 2008; Buchanan, 2007) point to

the fact that levels of flow have effect on retrieval performance, yet, Gruber, Ritchey, Wang, Doss and Ranganath (2016) posits the contrary.

Arising from reviews, research interest is to provide evidence that will spur learners to explore other innovative and active study strategies like the read and self-evaluate, read and underline/highlight, read and discuss, rather rely solely on the traditional and monotonous reread (read and read again) strategy with the aim of improving academic performance of learners. This research sought to investigate the effect of study strategy on recall and recognition of oral prose among secondary school students and also to investigate the effect of levels of flow on recall and recognition among secondary school students.

Given the fact that most students prefers to read and reread study materials, they neglect to exploit other innovative studying techniques which has the capacity to improve their learning and retrieval ability. The objectives of this study is to therefore determine which learning strategy will be best for learners in academic settings and to establish which learning strategy can provide the learners adequate level of flow during study to ultimately guarantee memory retrieval in both recall and recognition tests.

To achieve this research objectives, the following hypotheses were postulated: study strategies would have a statistically significant effect on recall among secondary school students; study strategies would have statistically significant effect on recognition among secondary school students; there would be a statistically significant difference in level of flow on recall among secondary school students; and that there would be a statistically significant difference in levels of flow on recognition among secondary school students.

## **METHOD**

### **Participants**

Eighty students of Fevosun College Makurdi, Benue State of North-Central Nigeria were involved in the study drawn from senior secondary school class-two (SS2) which had a total of 116 students in the three arms. Using simple random method, participants were selected. The participants comprised of 43 (53.8%) boys and 37(46.3%) girls. Their ages range from 13 to 20years (mean age=16.5years).

### **Instruments**

The study employed prose passage of 576 words titled “The last search” stimulus material curled from Amadi (1973). The Oral Prose Assessment Tests I & II (OPAT-I and OPAT-II) (Mefoh, 2010). OPAT-I is a recall test while OPAT-II is a recognition test for learners’ understanding of the oral prose, “the last search”. Originally this instrument was developed for university students by Mefoh (2010) and it yielded .83 and .60 Cronbach alpha respectively, and of .59 and .64 respectively for secondary school students. These measures have 10 items each and every correct response is awarded 2 points while wrong response attracts zero (0) point. Recall was tested with OPAT-I while recognition is tested with OPAT-II. There are also four (5) teaser questions for the read-self evaluate group to appraise their memory on the studied passage and no scores are attached to the answers for teaser questions.

The Study-Related Flow Inventory (WOLF-S) (Bakker, Golub, & Rijavec, 2017) was developed to measure absorption, enjoyment and intrinsic motivation of learners in academic learning context. The original development scale validation yielded total Cronbach alphas ranging from .82 to .88 (.85, .87, and .81 for absorption, enjoyment, and intrinsic motivation respectively) with undergraduates. Following the researchers' revalidation, it yielded .67 Cronbach alpha for Nigerian secondary school students. WOLF-S has 13 items with seven point responses from 1=never to 7=always respectively. Score ranges from 13 to 91 points. Scores on this scale was used to categorise participants as either with shallow (1-49) or intense (50-91) flow levels.

### **Procedure**

Approval was obtained from the school authority. Participants consent was obtained and afterwards briefed on the study's procedures before the experiment commenced. Each student had the right to decline from the study since participation was voluntary. No student objected from participating, as they were assured of utmost confidentiality. The selected eighty participants picked pieces of paper each from a hat which had one hundred and sixteen pieces of paper to draw a sample size for the study. Eighty participants who picked papers with YES were selected while those who picked NO were exempted from participation. The selected 80 participants went through another round of paper picking for random assignment into study groups. Out of the 80 pieces of papers, each set of 20 pieces had 1, 2, 3 or 4 printed on them and mixed together in a hat. The number each participant picked simply assigned him/her into that treatment group. These are, group 1 (reread condition), group 2 (read and self evaluate condition), group 3 (read and underline/highlight condition) and group 4 (read and discuss condition). Each of the groups ushered into different classrooms to allow spacing of participants per seat to control cheating. The procedure was coordinated by the researchers with the assistances of six well trained research assistants. Each group began each phase of the experiment once they heard "START" and ended when they heard "STOP".

In the first condition (reread), participants in this group received the following instruction; "you will be given a passage which you are expected to read the material twice within 15 minutes, after which you will complete the study-related flow inventory in five minutes before receiving the OPAT-I and OPAT-II test on the passage studied that will last only 10minutes for each". The read and self-evaluate group were informed thus; "you will be given a passage and you are expected to read the material once and then evaluate yourself the first time with the five teaser questions when you should try to attempt all the five questions within 15 minutes, after which you will complete the study-related flow inventory for five minutes before receiving the OPAT-I and OPAT-II test on the passage studied that will last only 10minutes for each".

Those in the read and underline/highlight condition will be made to understand thus; "you will be given a passage which you are expected to read only once, and while reading, you consciously underlining and memorize information you feel are noteworthy within 15 minutes, after which you will complete the study-related flow inventory for five minutes before receiving the OPAT-I and OPAT-II test on the passage studied that will last only 10minutes for each". The last group (read and discuss) were told thus; "you will be given a passage which you are expected to read the material once (within 10 minutes), after which you will quickly go into clusters of five persons per subgroup where you are to discuss the content of the passage read (within five minutes) and each member takes a minute to say

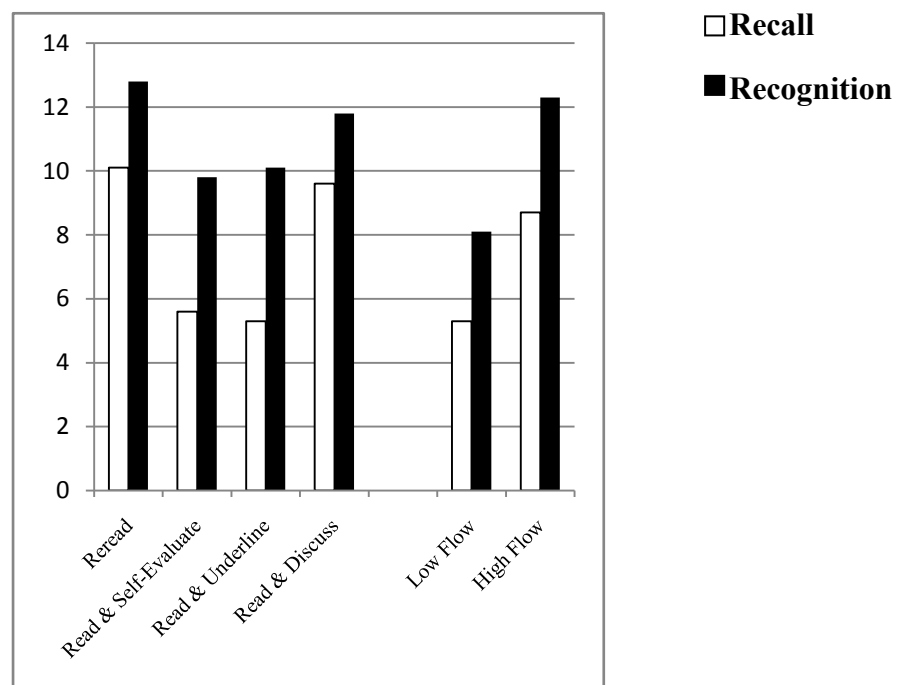
something informative from the passage to the members (reading and discussion is within ten minutes), after which you will complete the study-related flow inventory for five minutes before receiving the OPAT-I and OPAT-II test on the passage studied that will last only 10minutes for each”. The sub-groups in the read-and-discuss group will be established just by clustering along the group list with names written in alphabetical order, that is, 1-5, 6-10 etc and one proctor will be attached to each of the subgroups to moderate their discussion.

It took a total of 40 minutes to complete the entire study procedure for each condition. The five minutes spent in completing the WOLF-S inventory served as the retention interval before the test. Participants were debriefed and reinforced with one ink pen each.

### Design/Statistics

The study employed a 4x2 factorial design. Multivariate analysis of variance (MANOVA) was used to establish statistical significance of the test data using IBM Statistical Package for Social Sciences (SPSS version 21) for data analyses.

## RESULTS



*Figure 1: Mean scores of study strategy and flow levels on recall and recognition task*

Figure 1 show that participants in the reread condition performed best in recall ( $M=10.10$ ,  $SD=4.87$ ), followed by those in the read and discuss ( $M=9.60$ ,  $SD=4.28$ ), the read and self-evaluate ( $M=5.75$ ,  $SD=3.46$ ), and then the read and underline ( $M=5.30$ ,  $SD=4.65$ ) conditions. In recognition task, the read group were best ( $M=12.80$ ,  $SD=3.52$ ), next was the read and discuss ( $M=11.80$ ,  $SD=4.67$ ), followed by the read and underline ( $M=10.10$ ,  $SD=4.02$ ), and then the read and self-evaluate ( $M=9.80$ ,  $SD=4.49$ ) conditions. On the other hand, participants with high (intense) flow level while studying were better ( $M=8.65$ ,  $SD=4.83$ )

than those of low (shallow) flow levels (M=5.30, SD=3.84). In recognition, participants with high flow were better (M=12.35, SD=3.98) than with low flow (M=8.09, SD=3.54).

**Table 1: MANOVA results showing the effects of study strategy and flow levels on recall and recognition**

Independent Variables	Dependent Variable	df	MS	F	Eta Square
Study Strategy (A)	Recall	3	90.76	5.04**	.17
	Recognition	3	23.29	1.55	.06
Flow (B)	Recall	1	110.04	6.11*	.08
	Recognition	1	239.07	15.87**	.18
A * B	Recall	3	7.17	.39	
	Recognition	3	1.73	.11	
Error	Recall	72	18.13		
	Recognition	72	15.07		
Total	Recall	80			
	Recognition	80			
Corrected Total	Recall	79			
	Recognition	79			

**Keys:** \*= significant,  $p < .05$ ; \*\*= significant,  $p < .01$

Results from the MANOVA table above shows that study strategy has statistical significant effect on recall  $F(3, 79) = 5.04, P < .01$ . The effect size (.17) indicated that 1.7% of the variance in recall was explained by study strategy. According to the table, there was no significant effect of study strategy on recognition  $F(3, 79) = 1.55, P > .05$ . The MANOVA result also indicated a statistical significant difference for participants in the low and high levels of flow  $F(1, 79) = 6.11, P < .05$  and its effect size indicated that .8% of the variance in recall was explained by level of flow. Likewise, there was a statistical significant difference between participants in the low and high levels of flow  $F(1, 79) = 15.87, P < .01$  during academic study. The effect size indicated that 1.8% of the variance in recognition was explained by level of flow. The result showed no statistical significant interaction effect of study strategy and flow levels on recall and recognition. With same data, in checking for possibly being confounded by age factor, t-Tests showed no significant difference on memory performance.

## DISCUSSION

From the result, the first hypothesis which stated that study strategy will have significant main effect on recall among secondary school students was confirmed by this result which indicated participants in the reread group outperformed those in the rest three treatment groups in the following order read and self-evaluate, read and underline and read and discuss groups. This is in line with findings of previous researchers (Cohen, *et al.*, 2017; Sheridan & Reingold, 2012; Pyc & Rawson, 2012) who asserted that the strategy employed in learning has capacity to affect recall. This evident justifies Dunlosky *et al.* (2013) position that rereading strategy is most commonly used by students. On recognition, study strategy did not yield significant effect, thereby refuting the hypothesis that study strategy will significantly affect recognition which contradicts existing findings of scholars (Brown, *et al.*, 2016; Kornel, Klein & Rawson, 2014). This finding further shows that, as recognition is being

asserted, to be easier than recall tasks, given that retrieval cues are available during recognition tasks (Kornel, *et al.*, 2014).

The prediction that study flow would significantly affect recall was confirmed in totality. The result indicated that intense level of flow gives raise to high recall and that those with shallow level of flow during study faired less in both recall and recognition tasks. Works of Amini, Ayari and Amini (2016), Hidalgo, *et al.* (2015), Barbosa and Albuquerque (2008), Buchanan (2007) agree with the result of this current study that one's level of flow during study affects recall performance. Meanwhile, Gruber, *et al.* (2016) does not agree with the popular views. It is established fact that learning in a condition with less distraction allows the learner with intrinsic motivation to enjoy and absorb the study material, which in turn allows for optimal performance during retrieval.

Again, the effect of flow on recognition which was also confirmed, and in tandem with findings made by researchers (Robinson & Rollings, 2010; Dudukovic, *et al.*, 2009; Foos & Goolkasian, 2008) who did investigations on the effect of flow on recognition. This can be explained by the fact that despite one's study strategy, for recognition to occur, there are always available cues that aids one to effectively discriminate the stimulus so as to make a correct response (hit).

### **Implications of the Study**

As mentioned earlier, the essence of learning is to enable recall and recognition (retrieval), and achieving this requires the learner to adopt a study technique that suite his/her cognitive style. As there are different learners (the visual, audio, kinaesthetic, audio-visual, group, solitary etc), so also students must identify their best studying method in the presence of the best situation that ensure intense or high level of flow. Study pattern and cognitive style are closely related in the sense that one's personality disposition determines the way such a person will make choices and behave in different scenarios.

Teachers, school counsellors and parents must wake from the slumber of believing that a student's intelligence quotient (IQ) and aptitude are what forms the bases of students' ability in recall and recognition. Factors like absorption, enjoyment and motivation of studying which constitutes flow state, together with the approach adopted for such acquisition process are also much more significant in the prediction of recall and recognition capabilities. Parents also are to be mindful of this because it takes the home's consolidating efforts to help promote and sustain all the school teaches a child.

The implication of this study encourages education stakeholder to make policies and ensure the implementation of innovative teaching/learner methods which arouses the learners' interest. It is an established truth that the reread study strategy is the most widely adopted by students and they are very comfortable with its usage, but this research brings to fore the need for learners to explore other study strategies like the read and self-evaluate (using past questions), read and underline/highlight, engage in study group discussions etc. these certainly help improve academic performance, make students smart and master learners, and makes learning easy.



### Recommendations and Conclusion

The learners at the basic level of academic studies cannot benefit from inferences drawn from this investigation, since only secondary school students were involved in this study. The current study drew its samples from private school students only and so there is a need to conduct a well representative study that will involve equal number of participants from both private and public colleges to guarantee a robust generalization. This investigation was conducted in Makurdi the Benue State capital, students in other local government of the State and even other State of the Nigeria federation are technically not represented. Hence, there is the need to replicate same across the State and nation.

This study investigated effects of study strategy and flow on recall and recognition. Eighty (37 females and 43 males) secondary school students were involved in the study. Participants were randomly selected and assigned into four experimental groups and administered different treatments. Results showed that study strategy has significant effect on recall but not on recognition. There was a statistical significant difference in the levels of flow (shallow and intense) in both recall and recognition. These findings were interpreted on the bases of the theoretical and empirical literatures reviewed. Implication of the study were discussed, the study's limitations were highlighted with recommendations made for further studies.

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