An Experiment To Investigate The Ability To Recall Under The Influence Of Schema Theory

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Introduction

Cognitive psychology is the area of study concerning the human mind, how it processes information, and interprets the world. When studying areas of cognition, psychologists argue that the human brain makes use of personal, mental representations to think and make decisions (Axelrod 1973). Through previous experiences and knowledge, we each develop our own ways of processing information and making decisions. This is explained by schemas that an individual will form throughout their life. A schema is a mental structure of preconceived ideas developed through past experiences (Axelrod 1973). It explains the idea that new knowledge and experiences are organised and stored in schemas. Schema theory was proposed by Fredric Bartlett (1920) who sought to explain the ways in which our own preconceived knowledge can influence behaviours such as thinking and decision-making.

We studied this topic to learn more about the role that an activated schema can play in memory retrieval and the ability to make inferences from given information. Our schemas help us associate relationships between certain situations and the knowledge related to the situation (Zeithamova et al. 2012). The influence of schemas on memory recall and comprehension can be observed in our everyday lives. An example of this effect is the ways that we might perceive a text that we're assigned to read for homework. If the teacher informs us that there will be a comprehension quiz regarding the assigned text, our interpretation of the text will be much more thorough than if the teacher had instructed us to read for our own interest. This is because the teacher has activated a learner's schema of quizzes, allowing the relevant elements of the text to be better recalled.

Bransford and Johnson (1972) conducted a study that we will be replicating. The aim was to determine if a schema activation related to laundry would result in better recall of an ambiguous passage. The contents of the passage do not indicate that it is about laundry,

however, it may appear otherwise for someone who learns that the passage is related to laundry prior to reading it. The same passage will be used for our replicated study.

The independent variable in the original study was the presence or absence of the "schema activation" instruction. The dependent variable is the participants' level of recall, measured by the median number of correctly answered questions relating to the passage. Both the IV and DV were kept the same for the replication of this study.

The null hypothesis is that there will be no significant difference between the median number of correctly recalled questions from the participants who didn't hear the schema activation phrase and the participants who did hear the schema activation.

The research hypothesis is that the median number of correctly answered questions will be significantly greater for the participants who heard the schema activation phrase than the participants who did not.

Exploration

Students from a grade 12 mathematics class were used as participants, having been chosen by an opportunity sampling. Opportunity sampling allowed us to use high school students who are a suitable sample because they are likely to be familiar with laundry processes in their everyday lives. Furthermore, the students in the classroom were culturally diverse and representative across many cultures as this information was gathered by asking for participants' mother tongue in the consent form. Participants were of ages 16-17 with 7 girls and 13 boys. Ethical considerations were met as the participants were given a letter of consent seven days prior to the experiment (see app i). No one was under the age of 16 and required parental consent to participate. It was indicated that the researchers would assure participants' anonymity and keep results confidential. They would also have the right to withdraw at any given point during the experiment. The consent letter did not specify the aim of our study as this would interfere with the results. However, the participants were fully

debriefed after our experiment and the aim was revealed. Withholding the aim was not a serious consideration as the participants were not harmed in any way, nor was any stress caused.

Our replicated experiment used an independent sample design. This is necessary because each participant is meant to hear only one set of instructions. Participants were either allocated to the group that heard the topic of the passage before listening to it or the group who listened to the passage with no prior knowledge of its topic. The two groups are also known as the "topic before" and the control group respectively. Participants were randomly allocated into the two groups through an online generator. Those in the second group were led out of the classroom. The "topic before" group was then given the following instructions prior to playing the passage: *"Recall this passage to the best of your abilities without writing anything down. It may help you to know that the passage you will hear will be about washing clothes."* After playing the recording to group one, they were given a multiple choice questionnaire of six questions (see app. iii), with the instructions, *"answer with the correct answers to the best of your abilities."* They were given three minutes to complete the questionnaire.

After the first group had finished, group two was brought back into the classroom and group one was escorted. The control group was only given the first half of the instructions that the "topic before" group had received: "*Recall this passage to the best of your abilities without writing anything down."* The same procedure of playing the passage and providing the questionnaire was repeated.

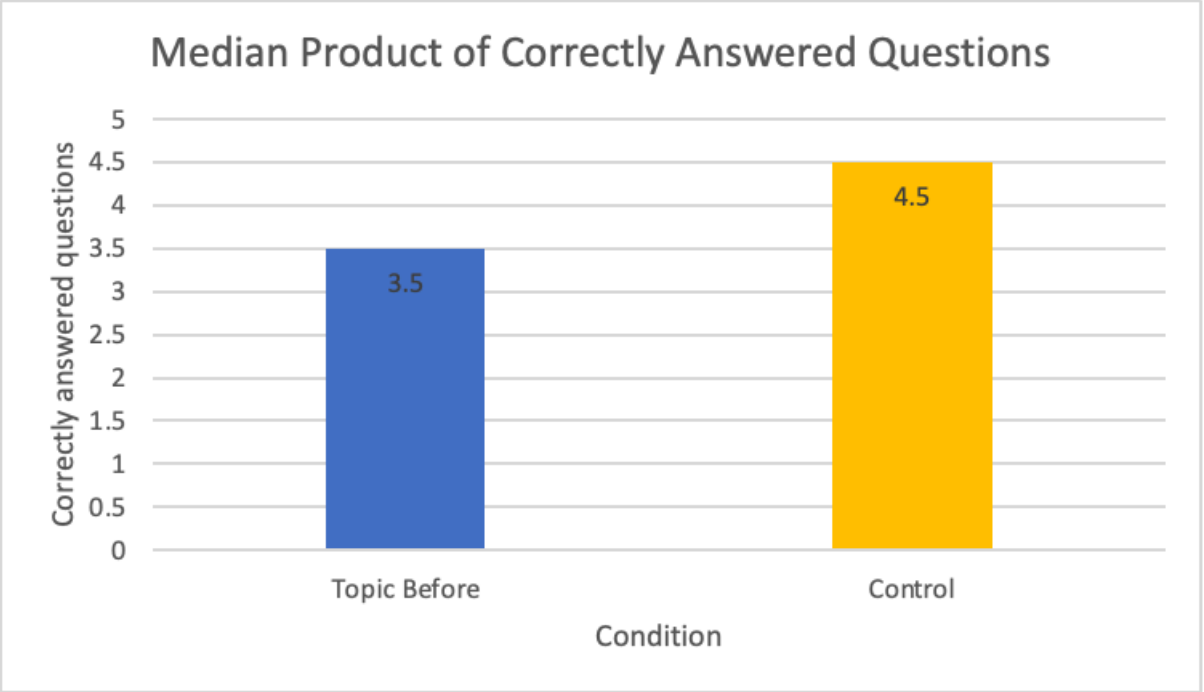
Many controls were undertaken during the experiment to avoid any confounding variables and to ensure internal validity. The passage was generated by a software program and played out loud (Free n.d.). This is so that each group would hear the same passage read at the same pace and tone. The researchers also gave the same standardised instructions in

order to control for any differences in understanding between the two conditions (see app ii). The groups were each escorted by a researcher so that they would not be able to see or hear the proceedings during the experiment, avoiding a participant predicting the aim of the study, known as “expectancy effect”. We further attempted to control this by preventing interaction between the two groups during the experiments and prevented any revelation of our aim prior to the experiment.

Analysis

Table 1. Descriptive analysis of data

“Topic before” condition	Median	3.5	Interquartile range	2
Control condition	Median	4.5	Interquartile range	2



As shown from the data above, the median for the “topic before” condition is a lower number of 3.5 correctly answered questions, whereas the median for the control condition was calculated to be 4.5. This is not on par with our research hypothesis that states that the

number of correctly answered questions will be significantly greater for the participants who received the schema activation than the participants who did not receive that schema activation. This is also reflected in the interquartile ranges that were calculated. The interquartile range is a measure of the dispersion around the calculated central median. As both conditions have the same interquartile range, it does not suggest that the data within the "topic before" condition is any more dispersed around the median, and therefore, there are not significantly more questions correctly answered in this condition than in the control condition.

Because of our small sample size and the use of independent samples, we conducted a Mann-Whitney U test that indicated that our results did not suggest a significant difference between the number of correctly answered questions from the condition that received the schema activation (Mdn= 3.5) and the condition that did not receive the schema activation (Mdn= 4.5), U= 41, p= 0.26109. There was no significant difference at $p < 0.05$. We failed to reject the null hypothesis.

Our p-value was not significant at $p > 0.05$. This is due to the inconsistencies in our participant's answers. Chance and participant variability plays a great role in recall tasks and this was supported by our insignificant p-value and the difference in the medians of the two conditions. Outlying data was not thrown out since this data may still be an indicator of insignificance between the condition that received the schema activation and the condition that didn't. However, due to one of the conditions having two more participants than the other condition, we randomly took out the data of two participants in that group. This was done completely at random and the researcher who removed their names was not informed of the performance of these participants.

Evaluation

Schema Theory states that every person possesses their own schemas, which are

mental frameworks of knowledge and experiences from an individual's past (Axelrod 1973). In the process of retrieving memories, preconceived knowledge stored in our schema aids in the ability to make inferences from given information. The idea presented by Schema Theory was not supported by the results of our experiment to determine whether or not a schema activation would result in better recall of an ambiguous text. However, in the original study conducted by Bransford and Johnson (1983), the condition that had received the schema activation before listening to the passage had much greater levels of comprehension and recall than the control condition did. These results were not achieved in the replication of the study.

Certain modifications were made to the original study. Rather than asking the participants to perform a free recall of the passage, we developed a questionnaire (see app. iii). We made this change to make it easier to measure their level of recall quantifiably. The questions we created, specifically targeted ideas that are able to be associated with the process of doing laundry, allowing us to determine whether or not the laundry schema activation would influence the results. A key limitation in this modification is that the researchers who created the questionnaire were not blind to the procedure and the theory behind it. There may have been researcher bias behind the creation of the questionnaire. We attempted to control for this by having all the researchers review the questions created, but, all the researchers were already familiar with the aim and procedure. Furthermore, the questionnaire was multiple choice. It is not possible to determine whether or not the results were a product of guessing rather than recall. This could have been a contributing factor to our insignificant results. Another modification made to the original study was the elimination of the condition where participants received the schema activation after hearing the passage. This was done because the "topic after" condition in the original study did not perform any better than the control condition, and was not influenced by the schema activation.

With the modifications, a key strength in our procedure is that it was highly standardised. Standardised instructions were given to both conditions to ensure that there was no difference in understanding (see app. ii). Both groups heard the same passage in the same voice and pace. They received the same amount of time to answer the questionnaire to guarantee equal processing time. These controls attempted to ensure that the two conditions were as similar as possible.

While both groups were asked to remain silent during the duration of the experiment, the participants did not remain silent when the groups were switched. A few participants in group one joked about the experiment being "very stressful" to the second group. When the researchers noticed this, we quickly instructed them to remain silent. This could have led to an expectancy effect in the second group. The occurrence of this situation suggests a strong limitation of using an opportunity sampling. This could have been prevented with the use of self-selected sampling. With the use of participants who willingly volunteer to participate in the study, these participants are likely to be more engaged with the experiment and more compliant with the instructions given.

Furthermore, a limitation of using an independent sample design is the confounding variable of participant variability. There is variability with regard to personal experience with the processes of washing clothes as well. It was also difficult to account for differences in the ability to memorise. We attempted to minimise the likelihood of this disparity between groups through the random allocation of participants. A modification to address this limitation would be using a matched pairs design. This would allow the comparison of data between two individuals who are nearly equal in background knowledge of laundry and abilities to memorise. One strength, however, is that by using a sample of high school students in the same age category, we were able to control, to the greatest of our extent the

participant variability. There likely was not too great of a disparity between participants when it came to the schema activation or ability to recall.

The experiment we conducted had both its strengths and limitations. Our p-value of 0.26109 was not significant at $p < 0.05$, indicating that there was not a significant difference between the two experimental conditions. Therefore, we fail to reject the null hypothesis, and cannot conclude that the activation of a schema will influence the ability for recall.

Appendix i: Letter of Consent

Dear student/parent/guardian, we are performing an experiment as part of our internal assessment for our IB Psychology class. We will be investigating a student's ability to recall a passage. We would like to invite you to be part of our experiment.

If you agree to take part in this experiment, you should know that:

- All data that we obtain will be kept **confidential** and **anonymous**.
- You have the **right to withdraw** from the experiment at any time.
- You will be **informed about the nature of the experiment and our results** in a few days after the experiment has been conducted.

The experiment will take roughly five minutes to complete.

If you agree, we ask that you sign the form below and fill in the following information relevant to our experiment:

Gender _____ Mother tongue _____ Age _____

I, _____, understand the nature of this experiment and I agree to participate voluntarily. I hereby give the researchers permission to use my data as part of their experimental study.

Signature: _____

Date: _____

If the participant is under the age of 16, the following parent/guardian consent is required:

I hereby state that _____ has my permission to take part in this study

Parent/guardian signature: _____

Date: _____

Appendix ii: Standardised instructions

Hi everyone, as most of you all probably remember we dropped by last week to hand out consent forms as a part of our IB Psychology Internal Assessment. To remind you all, we will be conducting an experiment relating to memory. Before we begin the experiment you all should know that all data and information that we collect will be kept confidential and anonymous. Information that we have asked for in the consent form will be seen only by us and will be discarded after the submission of our internal assessment. Please do not write your name anywhere on anything we will give you. You have the right to withdraw from the experiment at any given time. We will return within the coming weeks to inform you all about the nature of our experiment and the results of our experiment. We have divided you all into two groups. We will call out your names for which group you'll be in. Group one will remain in this classroom and group two will be brought outside where the inside of this classroom will not be visible. The two groups will then switch after the experiment has been conducted. If you did not sign a consent form, we will ask that you remain outside for the entire duration of the experiment.

Please begin by removing anything in front of you. Keep only a writing tool. We will begin by playing out a passage. We will ask that you remain silent during this time. Recall this passage to the best of your abilities without writing anything down. *It may help you to know that the passage you will hear will be about washing clothes.*

We will now pass around a short questionnaire that you will have 3 minutes to answer. Do not flip over the paper until we have instructed you to do so. Again, please do not write your name anywhere on the paper.

Appendix iii: Experiment materials

Passage

The procedure is actually quite simple. First, you arrange things into different groups depending on their makeup. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you are pretty well set. It is important not to overdo any particular endeavor. That is, it is better to do too few things at once than too many. In the short run, this may not seem important, but complications from doing too many can easily arise. A mistake can be expensive as well. The manipulation of the appropriate mechanisms should be self-explanatory, and we need not dwell on it here. At first, the whole procedure will seem complicated. Soon, however, it will become just another fact of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then one never can tell.

Questionnaire

- What is the first step?
    1. Order things by number
    2. Arrange things into different groups
    3. Label the prices of the things
    4. Record the origin of the things
- During the procedure, why may you have to go somewhere else?
    1. Due to the lack of facilities
    2. Due to feeling overwhelmed from the environment
    3. Due to the misinterpretation of the instructions
    4. Due to the environmental consequences
- How may a complication arise?
    1. From a miscommunication
    2. From the lack of parental permission
    3. From doing too many things at once
    4. From forgetting the procedure
- What may be a consequence of a mistake?
    1. Others will be harmed
    2. It can be expensive
    3. May damage the environment
    4. The procedure will reset
- How are the appropriate mechanisms manipulated?
    1. Through critical thinking
    2. With the help of expert advice
    3. From trial and error
    4. It should be self-explanatory
- How is the procedure referred to as?
    1. “It will be a cinch”
    2. “There will be nothing to it”

3. “It will become a walk in the park”
4. “It will become another fact of life”

Appendix iv: Raw data

Participant	“Topic before” group	Control group
1	6	0
2	4	3
3	5	5
4	1	1
5	3	3
6	2	5
7	4	4
8	1	5
9	4	5
10	3	6

Appendix v: Debriefing notes

- Our aim was to investigate whether or not a schema activation would result in better recall of an ambiguous text.
- We studied this topic to investigate the effect that our pre-existing schemas have on our memory. Using the recall of a passage was beneficial as it can reflect real-life situations For example, knowing that a text assigned to read for homework will be tested on the following day, the students are likely to better recall the contents of the text, rather than if the teacher did not say that the students would be tested on the material.
- One condition was given the schema activation with an extra bit of instruction, "it may help you to know that the passage you will hear will be about washing clothes". The other condition was not given this schema activation.
- No harmful or concerning deception was used in this experiment.
- Our results were not significant as the control condition had a median of a greater value than the group that was given the schema activation.

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