

IB Psychology SL Internal Assessment

The Effect of Context and Prior Knowledge on Comprehension and Memory of a Passage

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Introduction

Explanation of the theory linked to the investigation

Based on the schema theory, this investigation will explore the effect of context and prior knowledge on the memory of a passage. Memory is the cognitive process of encoding, storing, and retrieving information. Schemas greatly influence the development of memories. A schema is a mental framework of preconceived knowledge that assists in organizing new information. The schema theory hypothesizes that the knowledge individuals possess of the world is categorized and, thus, influences behavior and cognition. Humans often use an existing schema to deal with a new object or event, a process called assimilation.

Schema theory plays a large role in understanding the effect of prior knowledge on the memory of a passage because the theory suggests that preconceived knowledge frameworks will aid in how information is encoded, stored, and retrieved from the passage. Furthermore, this study will demonstrate how schemas affect cognitive processes, particularly memory, and how context affects the accuracy and extent of the participants' recall.

Aim and relevance of the investigation

The aim of this study is to investigate how context or prior information influences auditory comprehension and recall in English-speaking high school students.

It is relevant as it has implications for academic performance in high school students. Furthermore, this investigation will show that schema-related events are remembered more effectively than ones not

prescribed by schemas, thus having relevance in how students who understand and place their learning within specific contexts may be able to remember the content better. Additionally, findings from this study could be used to create study methods for people who intend to improve their memorization skills.

IV & DV | Operationalized in null and research hypothesis

There are two conditions of the independent variable. The first condition is when no context is provided: participants simply listen to the audio passage once without any prior information or context. The second condition is when context is provided: participants are given context in the form of an image illustrating the audio passage before the audio is played.

The dependent variable is the participants' ability to recall ideas from the audio passage correctly. This will be measured by the number of correct ideas the participants recall.

- H_0 : There will be no significant difference between the number of accurately recalled ideas from the audio passage whether participants are provided context or not provided context.

- H_1 : Participants under conditions where context is provided will accurately recall significantly more ideas from the audio passage than those who do not receive context.

Exploration

Design and sampling technique of the investigation

The research design used in this experiment is an independent measure. This is when participants are split into different groups and, thus, experience different conditions depending on which group they are allocated to. As mentioned, the two conditions used in the experiment were no context-given and context-given. The participants were allocated using an alternating method: if the first participant is a part of condition 1 then the next participant would have to be part of condition 2. Independent measures design was used as it controls the participants' expectancy effect. This is because if they were to experience both conditions, they might have figured out the aim of the study and would have been able to get higher scores, impairing the accuracy of the experiment.

The sampling technique used was opportunity sampling. Whoever met the requirements and was available at the time of the experiment was approached and asked to participate. This technique was used as it guaranteed that the sample was effectively organized in a timely manner.

Choice of participants and sample characteristics

The study consisted of 20 participants, of which, 10 were part of the no context-given condition and the other 10 were part of the context-given condition. The participants were all high school students attending an international private school of over 2900 students. Gender was split equally among participants, with 10 females and 10 males. All participants were in grade 11 and all were 16 or 17 years of age, with a mean age of 16.6. Only high school students over 16 years of age were included to ensure that participants were cognitively able to perform the required task. This was also done to ensure that no

ethical boundaries were crossed regarding parental consent. Only grade 11 students were chosen to ensure that all participants had relatively similar levels of educational and cognitive abilities.

Control variables

One control variable in this investigation was prior knowledge. If participants read the case study or know the aim of the original study by Bransford, J.D. & Johnson, M. K. (1972), it is likely to influence their mindset while taking the test, allowing them to recall more ideas from the passage. This would be common in psychology students, thus, any IB Psychology student was not permitted to be part of the study.

Another control variable was the experiment's environment. Environmental factors like noise or distractions could impede participants' concentration and recall. This was controlled in our experiment as we ensured that each investigation was done in a quiet place like the school library.

Choice of materials

- Forms of consent (see Appendix I). The consent forms were signed by all participants and were used to confirm the validity of their responses and their compliance with the results being used.
- Standardized instructions (see Appendix II). Standardized instructions were used to inform the participants about the study they are being a part of. We ensured not to tell the participants the hypothesis of the investigation before they took part.

- Context image (see Appendix IV). The context image was a sketch illustrating the content of the audio passage. It was used as it is essential for the findings of the study. We used the same context image as the original study by Bransford & Johnson (1972).
- Laptop. A laptop was used to play the passage out loud. We used an audio creator website that read the passage in the voice of a 30-year-old, English-speaking man. We used the website: <https://www.naturalreaders.com/online/>.
- Debriefing notes (see Appendix III). After the experiment was complete, participants were thanked and debriefed using the debriefing notes. This was done to explain the background of the study and the reason we are conducting this investigation.

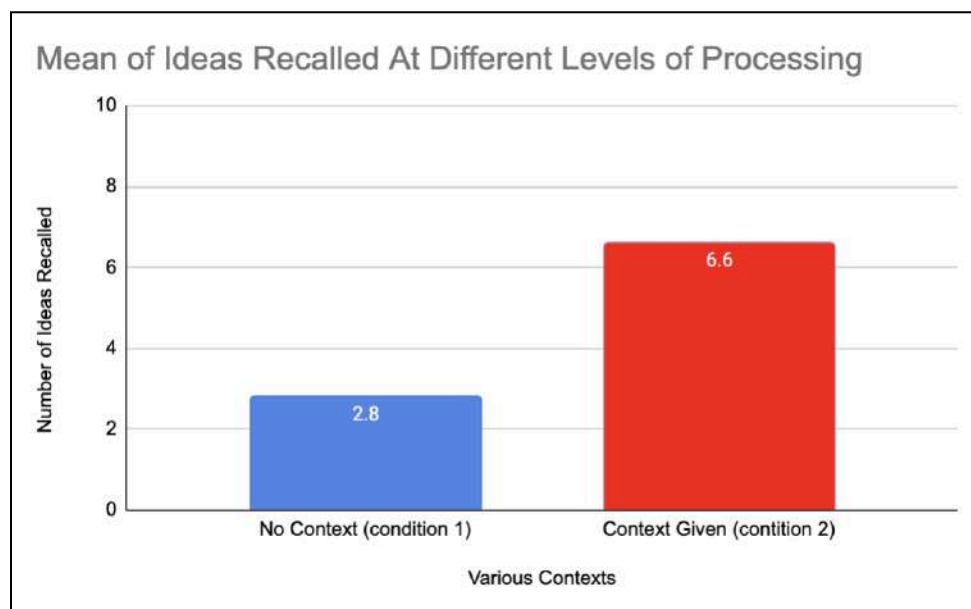
Analysis

Descriptive Statistics

Figure 1. Central Tendency and Measure of Variance Chart - Participants under conditions where context is provided will accurately recall significantly more ideas on average from the passage than those who did not receive context.

	Mean	Standard Deviation
Condition 1 (No context)	2.8	1.4757
Condition 2 (Context)	6.6	1.8378

Figure 2. Central Tendency Graph - Participants under conditions where context is provided will accurately recall significantly more ideas on average from the passage than those who did not receive context.



In Table 1, the mean of ideas recalled and the standard deviation of each attempt in respective conditions are displayed. Table 2 illustrates the difference in the mean of both conditions as a bar graph. As seen in both tables, the mean ideas of the context-given condition are 3.8 idea units greater than the no-context condition, demonstrating the positive influence of prior knowledge on memory and recall of an auditory passage on English-speaking high school students. The standard deviation of the context-given condition marginally differs from the control group, at 1.8278 and 1.4757 respectively.

Inferential statistics

The Mann–Whitney U-test was chosen because we used an independent sample design and the size of the sample and lack of standard distribution of data was reduced to ordinal. Based on the Mann-Whitney test, the critical value of U at $p < .01$ is 19, the z-score is -3.40168, and the p-value is .00034. Therefore, the result is significant at .01, and so, We reject the null hypothesis and accept the experimental hypothesis: participants under conditions where context is provided will accurately recall significantly more ideas on average from the passage than those who did not receive context. However, we were careful not to make a Type I or II error. The difference between the two conditions is relatively large, yet the size of the sample is small, at 20 in total. This may lead us to falsely reject the null hypothesis. However, since the p-value is so low, a Type I error is unlikely. Additionally, the standard deviation in both conditions is low, making our data more consistent and reliable. Thus, ensuring that we did not make a type I or II error in our investigation.

Evaluation

Findings compared to Bransford & Johnson (1972) & Schema Theory

We used the same auditory passage as Bransford & Johnson (1972); however, we identified a total of 10 ideas from the passage while the original study chose 14. This was because a few of the ideas portrayed similar meanings and were effectively redundant. Bransford & Johnson (1972) had a total of 5 conditions: “No context (1), participants simply heard the passage; No context (2): participants heard the passage twice; Context before, before hearing the passage participants were provided with a context picture; Context after, the same image was shown after participants heard the passage; And partial context: a rearranged context picture was provided before the passage.” (Alexey, P., 2018). Bransford & Johnson's (1972) results were measured in idea units:

- No context (1): 3.6
- No context (2): 3.8
- Context before: 8.0
- Context after: 3.6
- Partial context: 4.0

Our study consisted of 2 conditions: one was given context before and the other was not given any context. Both conditions listened to the passage once. Our results showed that the context-given condition recalled a significantly greater average number of ideas. In the no-context group of the original study, participants recalled an average of 3.6 correct ideas while our participants, of the same group, recalled an average of 2.8 correct ideas. This discrepancy was also apparent in the context-given group; the original study's participants recalled an average of 8 correct ideas while our participants recalled 6.6.

Despite the subtle differences in ideas recalled between studies, the findings of our study are congruent with the schema theory. It suggests that the schema theory plays an important function in the recall of an auditory passage. Moreover, the theory suggests that preconceived knowledge frameworks will aid in how information is stored, encoded, and retrieved, linking to the results of our study. This link is materialized by the context-given condition recalling more ideas than the no-context condition. The context, an image illustrating the contents of the passage, works as a tool by which participants were able to use schemas to enhance their understanding of the passage.

Strengths, limitations, modifications of the design

In an independent samples design, different participants were used for each condition of the investigation. The research design used in this experiment is an independent measure. One **strength** of this is that participants are less likely to find out the hypothesis of the investigation. Additionally, there is no order effect since each participant only partakes in one condition. As a result, participants would not be able to change their behavior because of understanding the basis of the study, fatigue, and boredom.

A **limitation** of using an independent samples design is that we cannot guarantee that all participants have the same English proficiency. Although our sample consisted of participants who are in the same school, grade and are fluent in English, some participants may have had better English comprehension skills than others, increasing their recall of ideas.

A **modification** linked to this limitation could be to use a matched pairs design. In a matched pairs design, participants are paired based on a specific characteristic and then divided into various conditions. This would help control for individual differences between participants, such as their English proficiency, cognitive abilities, and memory capacity, thus maximizing the reliability of our findings in this investigation.

Strengths, limitations, modifications of the sample

One **strength** of our sample was that we used opportunity sampling. This allowed the make-up of participants in both conditions to be organized timely and efficiently. Whoever met the requirements and was available at the time of the experiment was approached and asked to participate. Another strength was that all of our participants.

A **limitation** was that our study was limited to the 16-17 year age group. This means that our results would only apply to mid to late teens and are not generalizable to large populations of people.

A **modification** linked to this limitation by investigating this phenomenon on several different age groups independently. This would allow researchers to determine if the findings of this study are congruent with multiple groups of people without risking confounding variables like comprehension or English proficiency based on age.

Strengths, limitations, modifications of the procedure

One **strength** of our procedure was that we standardized all materials needed to ensure the same procedure for all participants. Participants listened to the same recorded audio from an online audio player, all images were printed out in the same size and quality, and each participant took part in the experiment in the same location. This restricted any variables that could weaken our findings.

A **limitation** of our procedure was that each participant was given as long as they wanted to analyze the image in the context-given condition. This may have resulted in some participants understanding the image to a greater extent than others in the same condition, resulting in variations in the output of ideas recalled based on factors other than using schemas.

A **modification** linked to this limitation would be to ensure that each participant would only be able to analyze the image for a specific amount of time. This would allow factors like superior analysis of the image or a lack of analysis of the image to not affect the findings of the study.

From our study, we can conclude at $p < 0.01$ level of significance that when a participant is given context before listening to the passage, they are more likely to recall a greater number of correct ideas than participants who solely listen to the passage, demonstrating that schemas influence cognitive processes like memory and the recollection of material from a stimulus.

Appendix I - Consent Form

Participant Full Name: _____

Participant Grade: _____

Participant Email: _____
(optional)

Participants Age: / /
 MM DD YY

I confirm that I am **not** an IB psychology student - Yes No

I confirm that English is my first language - Yes No

I would like my results to be emailed back to me - Yes No

I would like for my identity to stay anonymous - Yes No

By signing this form, I _____, agree to be a voluntary participant in the experiment conducted by 11th-grade IB students as a part of their Internal assessment. By doing so I will be permitting the researchers for my data to be used as part of the study and confirming that I understand my right to withdraw at any time during the experiment.

Participant Signature: _____ Date: _____

Researcher Signature: _____ Date: _____

Appendix II - Standardized Instructions

Pre-experiment information:

Hello, my name is _____, and I am experimenting as a part of my IB Psychology IA. The document I will be giving you is a consent form that confirms your name and age and will give you the option to stay anonymous or get sent your results afterward. Please read this form carefully and understand that you have the right to withdraw from this experiment at any time.

Condition 1:

During this experiment, you will listen to a short pre-recorded audio of a text passage, please listen carefully as afterward you will be given a paper and pencil to jot down any ideas that you can remember from the text. You will only be able to listen once, and you will be given as much time as you need to recall. Please let me know if you have any questions.

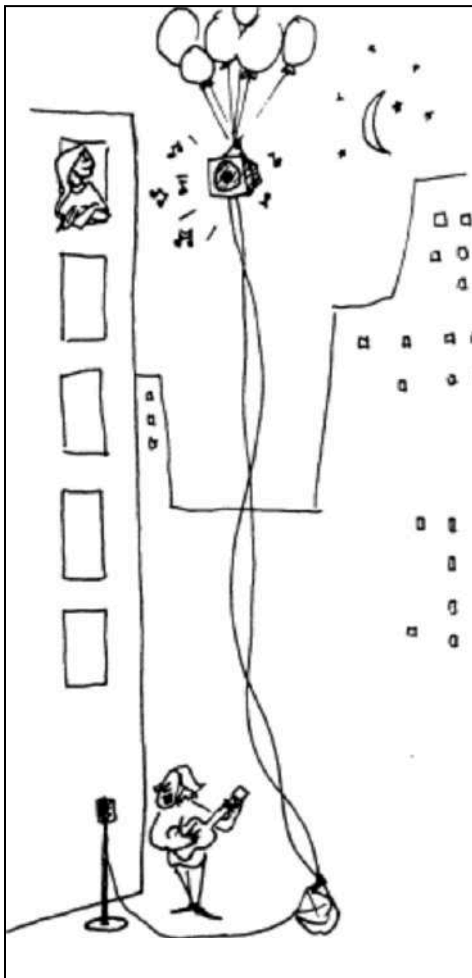
Condition 2:

During this experiment, you will listen to a short pre-recorded audio of a text passage, beforehand, you will be shown a picture that provides context on the ideas of the passage. Please listen carefully as afterward you will be given a paper and pencil to jot down all ideas that you can remember from the text. You will only be able to listen once, and you will be given as much time as you need to recall. Please let me know if you have any questions.

Appendix III - Debriefing Notes

Thank you for participating in the experiment, I can now inform you that this experiment aimed to investigate how context influences the comprehension and memory of an audio passage. You were under condition **(1 or 2)** where **(you were/not given context)**. You are now dismissed, however, please avoid telling any other possible participants what the experiment is or what it is about.

Appendix IV - Context Image



Appendix V - Raw Data

Participant	Condition 1 (No context)	Condition 2 (Context)
1	3	6
2	4	6
3	5	5
4	2	4
5	5	7
6	1	9
7	2	10
8	3	5
9	1	7
10	2	7
total	28	66
mean	2.8	6.6

Appendix VI - Inferential Statistics

Mann-Whitney U Test Calculator

The value of U is 4.5.

You'll notice below that we have calculated a critical value for U based on alpha level and whether your hypothesis is one or two tailed. We have also calculated a value for Z and its associated p -value. Results in blue reach significance. Results in red do not.

Sample 1

3
4
5
2
5
1
2
3
1
2

Sample 2

6
6
5
4
7
9
10
5
7
7

Significance Level:

.01

.05

1 or 2-tailed hypothesis?:

One-tailed

Two-tailed

The U -value is 4.5. The critical value of U at $p < .01$ is 19. Therefore, the result is significant at $p < .01$.

The z -score is -3.40168. The p -value is .00034. The result is significant at $p < .01$.

References

Nickerson, C. (2024, February 2). *Schema Theory In Psychology*. Simply Psychology. Retrieved September 2, 2024, from <https://www.simplypsychology.org/what-is-a-schema.html>

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