REPORT

Effects of Learning Style Preferences

25.04.2023

Case B

ALPINE
INSIGHTS

ALPINE INSIGHTS

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Executive Summary

The ability to learn and retain information varies greatly from person to person, and educators have long sought to develop teaching methods that accommodate individual differences.

The aim of this study is to investigate whether incorporating a student's learning style preference into teaching methods would improve the retention of material taught.

The results of our analysis showed that the experiment group demonstrated greater long-term retention of content than the control group, indicating that incorporating learning style preferences into teaching methods can improve the retention of material taught.

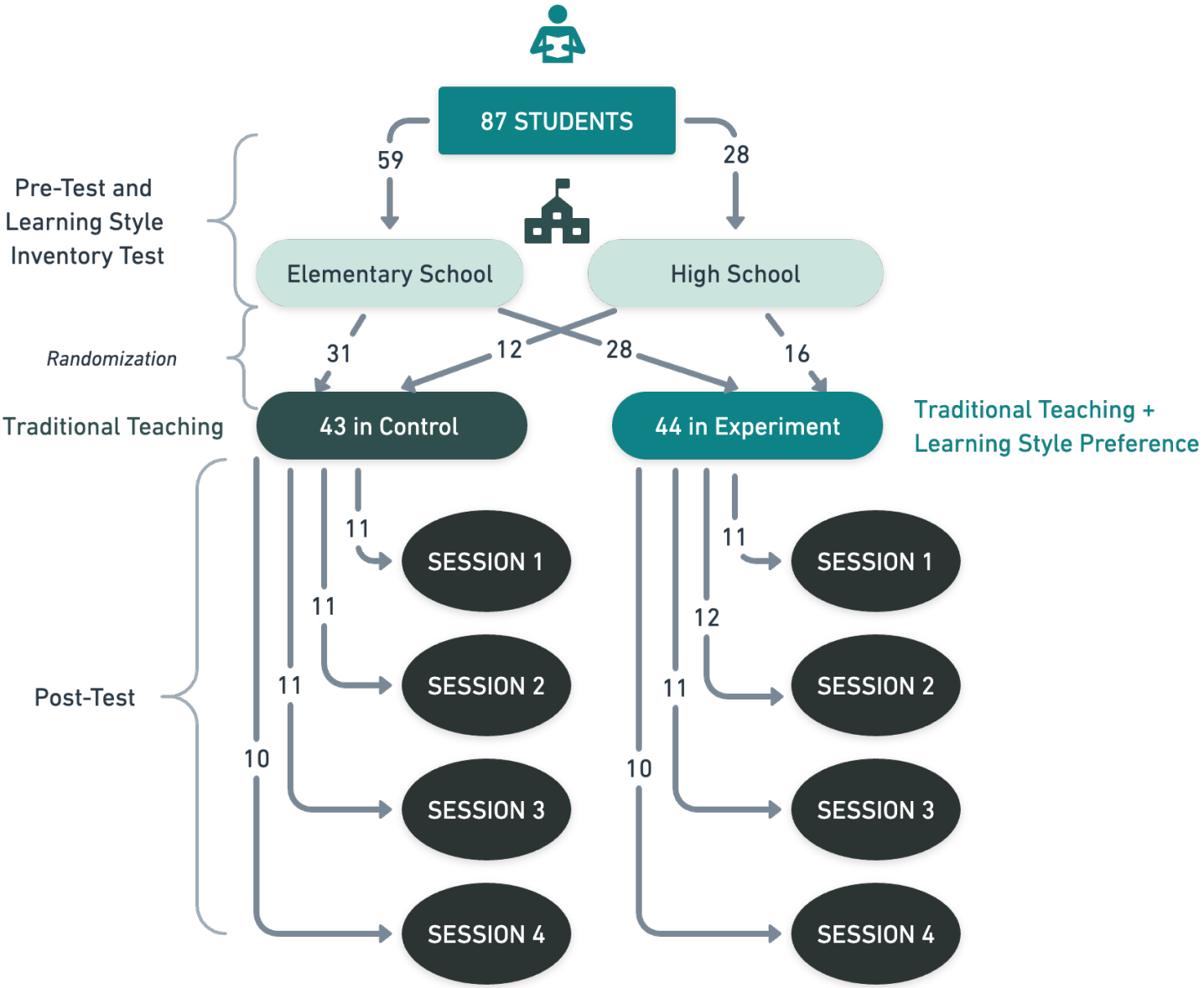
Introduction

Our analysis aims to investigate whether teaching based on a person's learning style preferences would improve the retention of content. The study involved high school and elementary school students who were randomly allocated into two groups: control and experiment. The control group received traditional textbook teaching, while the experiment group received traditional teaching augmented by activities specifically suited to their preferred learning styles.

The learning style inventory test was used to categorise the preferences of both groups of students. To evaluate the effectiveness of the teaching, an assignment was conducted before and after one month when the completion of the teaching was done.

The data includes variables such as group (indicating whether the student was part of the control or experiment group), session (denoting the session number), learning style preference (tactile, kinesthetic, auditory, visual, no preference), gender (male, female), school level (high - elementary school, pre-test score (from 0 to 100), post-test score (same scale as pre-test score), and attitude scale score (from 0 to 60).

Client Experiment



Results

The aim of our research is to find out whether or not lessons with specific methods focusing on students' learning preferences improved their retention of content. We used statistical tools to evaluate the effect of these new learning methods.

In our case, it seemed appropriate to use the difference-in-difference method, which is a statistical method for calculating the effect of a new policy or method by comparing the experimental group to the control group.

Data such as the session, the school level, the attitude score, the gender and the learning preferences of the students were not useful to estimate the treatment effect. Moreover, we observed no difference between the different sessions, between girls and boys, and between the learning preferences the students had.

Difference in differences

From a more theoretical point of view, this tool calculates the average scores of the control group and the experiment group for the pre-test and the post-test. Then, we looked at the differences between these averages in order to estimate the effect of the experiment.

On the graph below (*difference in differences method*), we can see the important coefficients related to student test score. After calculations, we obtained some estimates which led us to following conclusions:

1. No differences in score between the pre-test of the two groups (which is what we expected as the students were randomly assigned to the groups).

2. An increase in score between the two tests for the control group, which seems logical since there was a learning phase between the tests.

3. Significant effect of the treatment. If there were no treatment effect, the lines below on the graph would be parallel.

Take away: Students who participated in the experiment classes on average increased their score by 13.67 points compared to their classmates in the control group.

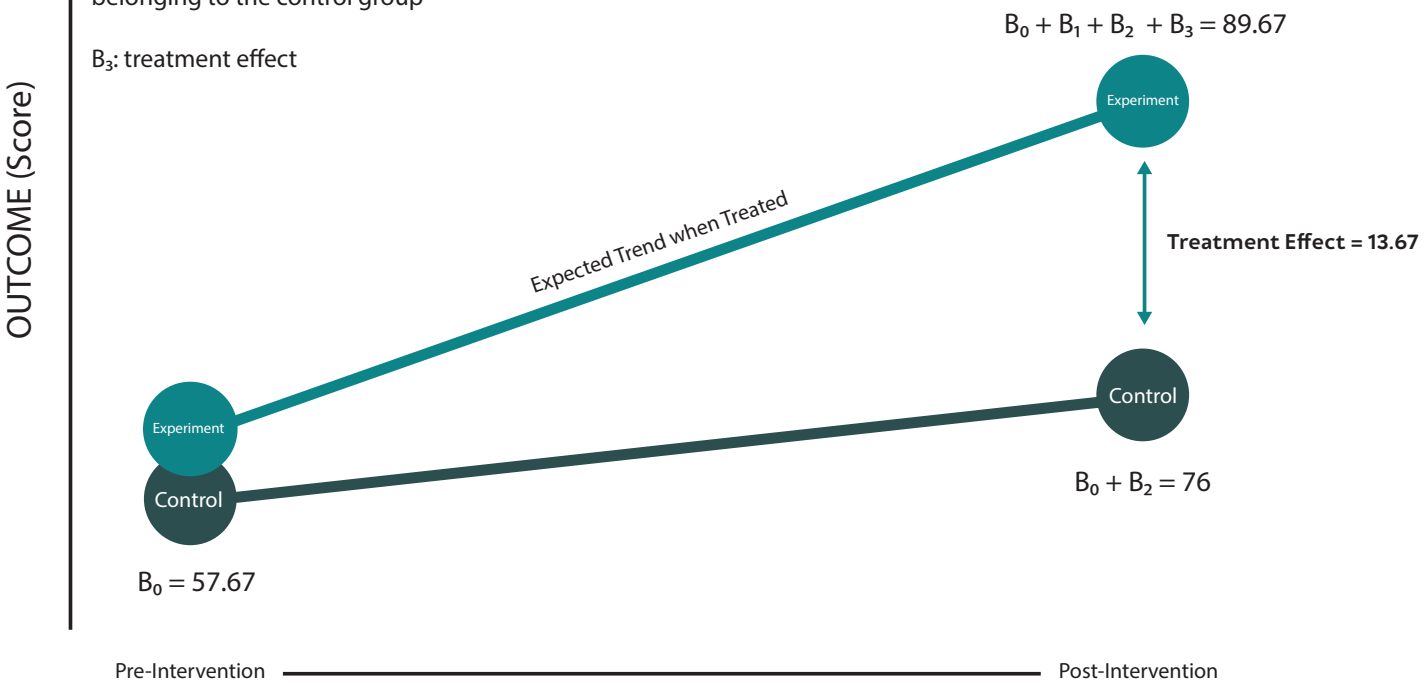
DIFFERENCE IN DIFFERENCES METHOD

B_0: average score of the control group before the treatment

B_1: difference of the pre-test scores between the control group and the experiment group

B_2: difference between pre-test scores and post-test scores for students belonging to the control group

B_3: treatment effect



The graph displays two lines. The dark one is for the control group and the light one is for the experiment group. Both lines start on the average pre-test score and end at the average post -test score. We notice an increase in score for both groups, which is logical since they both had a learning phase. However, it clearly seems that the experiment group students drastically improved their score on the post-test.

Extensions

We have also analysed possible extensions that could provide us some additional information on the impact of the new learning methods.

1. Separating students by pre-test scores

We first analysed differences between “good” and “bad” students, separating students in two parts: lowest pre-test scores and highest pre-test scores.

Comparing “bad” students vs “good” students

	Low pre-score students (score from 0 to 55)	High pre-score students (score from 55 to 100)
Average difference in scores between experiment and control group	+17.52	+7.18

When looking at the table above, we can say that the preference based learning style had a greater impact on students who obtained a low score on the pre-test. However, we should underline the fact that students who got a higher score on the pre-test can only improve by a little bit, because the maximum obtainable score is 100 (the difference will thus automatically be lower).

Take away: the impact of specialised courses based on preferences had a bigger effect on students who scored between 0 and 55 on the pre-test.

2. Separating students by school level

We also deepened our analysis by focusing on a student’s school level, dividing students in two parts: those in high school, and those in elementary school.

Comparing high school students vs elementary students

	High school students	Elementary school students
Average difference in scores between experiment and control group	+ 18.02	+10.85

We noticed a higher score increase for students in high school who attended the learning preference classes. Thus, we could assume that the new learning methods are more effective for older students.

Take away: the impact of specialised courses based on preferences had a bigger effect for high school students.

Conclusion and recommendations

The results of our analysis demonstrated that the experimental group, which received their perceptual learning style preference, improved long-term content retention compared to the control group. This suggests the potential benefits of using a perceptual learning style alongside the traditional teaching format.

However, it is important to acknowledge a few limitations of the research. Firstly, some students' scores decreased between the pre-test and post-test. We would recommend investigating the reasons behind it. For instance, if the students were absent or unwell during the second test, or if they missed any classes between the two tests. This is important as it could have potentially biased the estimations, given that the students were expected to learn and make progress during this time.

Another limitation is the lack of data in some groups. As seen in the first plots in the Appendix, there were more females than males, more elementary school students than high school students and some preferences had smaller sample sizes than the others. These important points could change the results or reveal other trends among gender or levels of study.

Additionally, there may be a participation bias, as the students who chose to participate might differ from those who did not. For instance, motivated students might be more likely to participate in the study, compared to less motivated students. It may occur in a non-representative sample and lead to biased estimations.

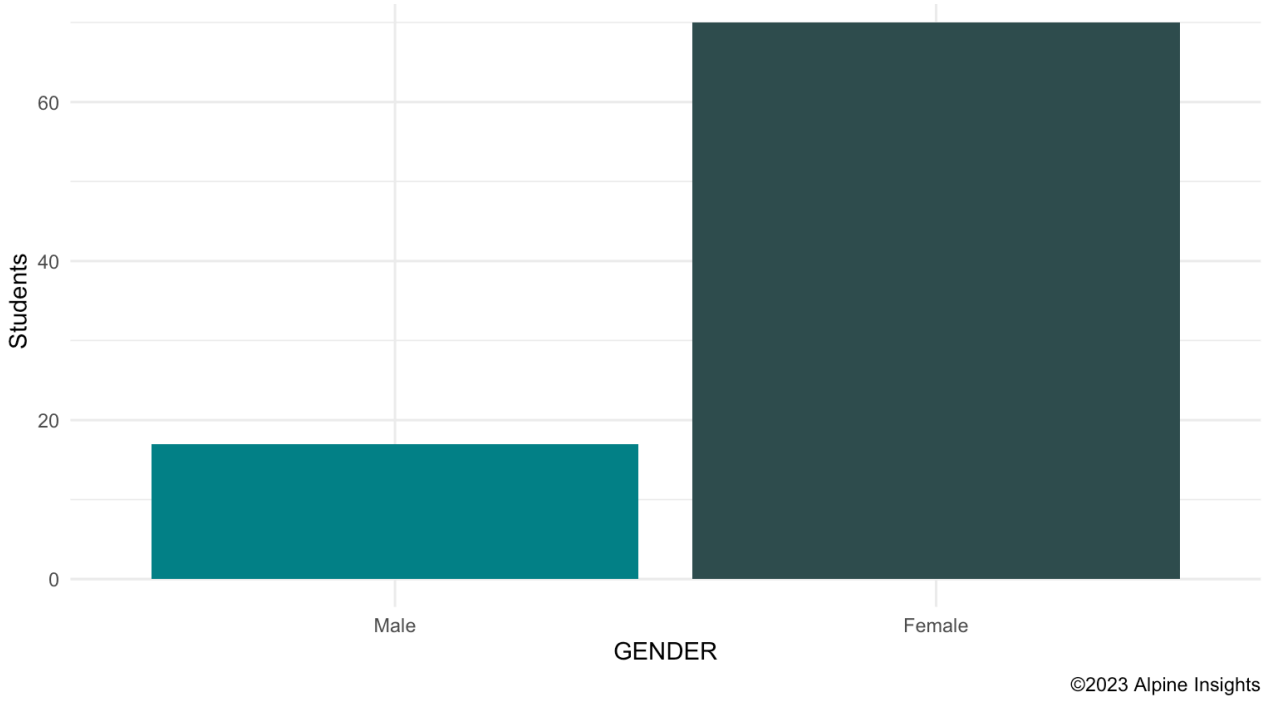
Finally, we suggest that you focus on the few points we have raised when collecting the data, in order for us to better understand the benefits of these new teaching methods. That way, we will be able to provide you with some more specific results and other important conclusions.

Appendix

Here figures are shown which deliver additional insights for interested readers. Thereby they do not add any complementary results but give a better understanding of the data that was analysed and the study limitations when it comes to extrapolation of the results to a different setting.

→ Figure 1 - Barplot of Students Gender

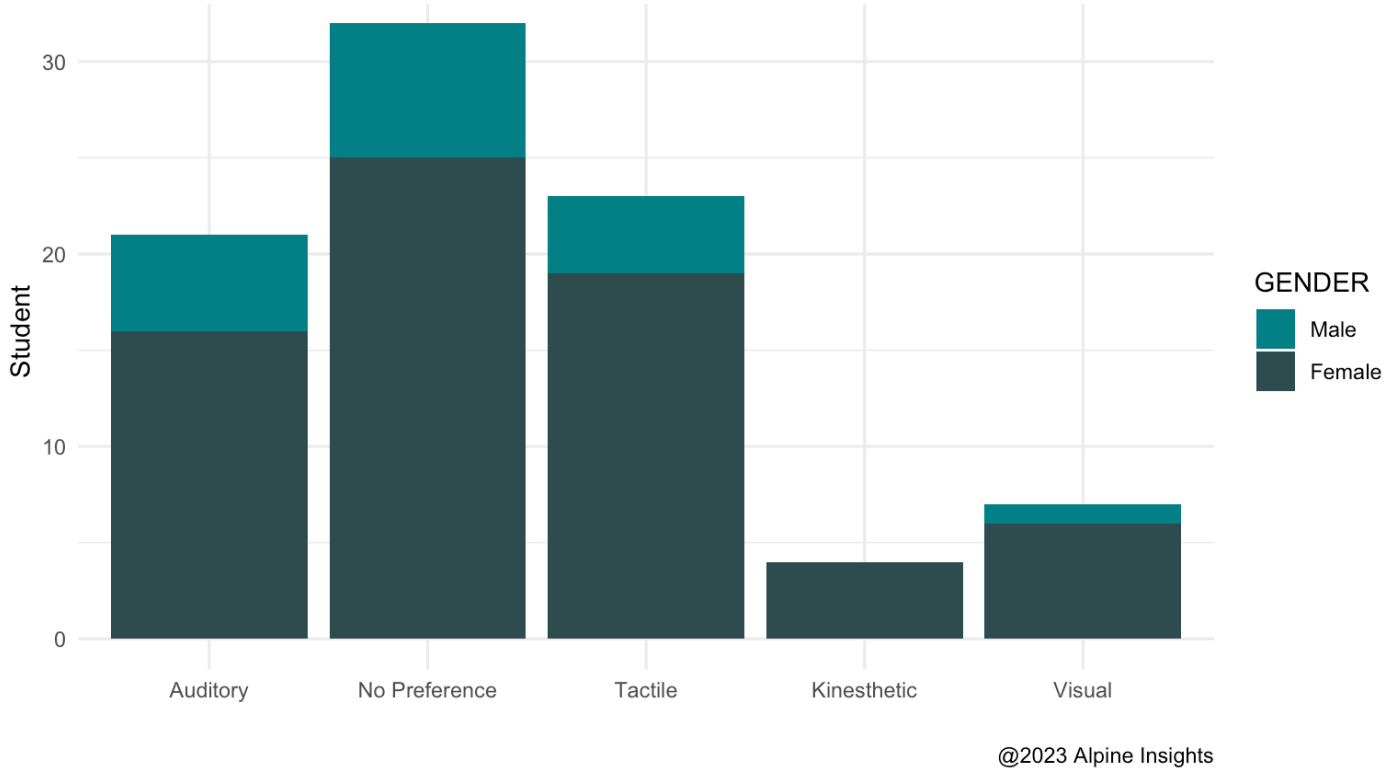
Figure 1 shows the distribution of genders in the examined data. It is observable that there is a bigger proportion of females than males across all of the data. This is not preferable and should be avoided in future studies as it could lead to a biased outcome as males could perform worse than females and therefore the final results would turn out better than when the groups would be balanced.



Barplot of the number of males and females in the study, control and experiment groups combined. There are 70 females and 17 males.

→ Figure 2 - Barplot of Students Preferences

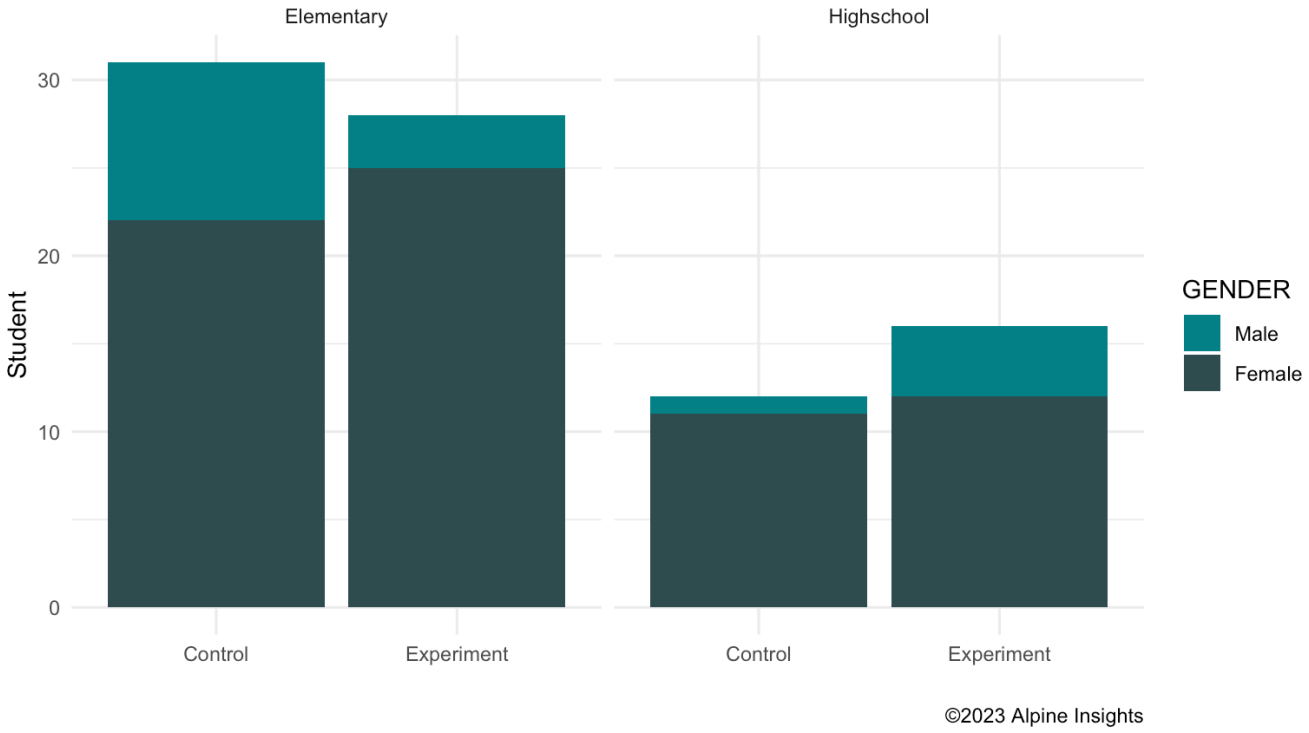
In **Figure 2** the separation between highschool students and elementary students are shown. Again it can be seen that there is an imbalance between the participants of high-school and elementary school. Although this difference is smaller it can still lead to problems when doing analytics on it.



Barplot of the number of students per preferences and gender. For instance, there are 21 students with the Auditory preference : 16 females and 5 males.

→ Figure 3 - Barplot of Students Groups and Schools

Down below we combine the insights from **Figure 1** and **2** and also add the information if the participant was in the control or experimental group. What can be observed is that there is almost the same number of participants in the control group and experimental group for highschool students as well as elementary students. Nevertheless the imbalance in gender is still persistent.



Barplot of the number of students per group (control or experiment), education level and gender. For instance, among the 59 students in elementary, 31 are in the control group and 28 are in the experiment group. There are 22 females and 9 males in the control group of the elementary level.

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