Spatial Cognition and Video Game Experience in AP Science Students

An Analysis of AP Science Student's Spatial Cognition, and its Implications of the Field of STEM

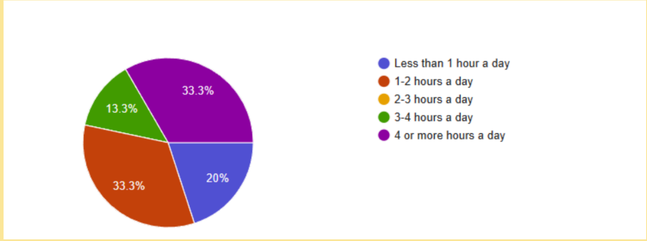
Introduction

Within the U.S., 43% of adults and 90% of teens regularly play video games, meaning video games play a massive role in society, both as a hobby and as a career (Flores, 2017). This interconnectedness between video games and society brings necessary questions about the benefits of video games. With nearly 30% of the world's population (roughly two billion people) playing video games, the prevalence of video games within modern society cannot be denied (as cited in Cruz, 2019). Simultaneously with the rise of video games within modern society, STEM jobs have riven in prevalence, according to the National Center for Science and Engineering Statistics (NCES). These numbers are nearly double those from 2016, showing an exponential increase of the STEM field within society (Okrent, 2021). Scientists have found a connection between STEM jobs and video games: spatial cognition, the ability to collect, organize, use, and visualize information about one's environment (APA, 2018).

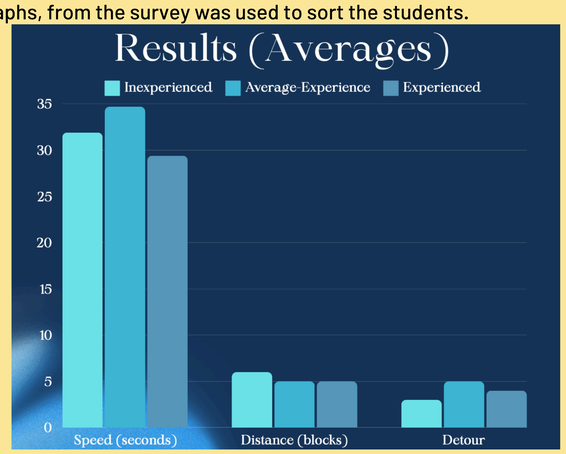
Methodology

This study employs a quantitative correlational factor analysis to examine the potential relationship between video game experience and spatial cognition. This method takes the broad variable of spatial cognition and breaks it down into smaller factors: speed, accuracy, and detour rate to examine a possible correlation between these variables. Participants were given a survey to gauge their video game experience. After the survey, participants were given a game to play to test the variables of spatial cognition. In the game, participants were tasked with finding a balloon in a virtual park. After collecting the balloon, participants were relocated somewhere within the park, and tasked with placing the balloon in its original place. The Pearson Correlation Coefficient Calculator was used to correlate the statistics of their in-game performance with their video game experience by calculating an R-value (a measure of correlation).

Findings



The 15 participants were sorted into three 3 groups; unexperienced, average experienced, and experienced. This graph, along with other graphs, from the survey was used to sort the students.



The R-values (a measure of correlation) and the graph (the average scores per group) indicate the correlation between all three data sets and the participant groups. The closer the R-value is to 0, the weaker the correlation, and because the R-values for speed, distance, and detour were -0.38, 0.16, and 0.117, the data indicates that the correlation between spatial cognition and video game experience was weak. This means that the years of experience had little impact on the spatial cognition of AP science students. However, the results did show a distinct difference in the students: the participants, despite their experience, showed similar results from the experiment. The experienced group showed a faster speed compared to the other groups, while the inexperienced group had a lower detour rate compared to the other groups. While there was a distinct group that performed better in every category, the overall data was homogenous.

Discussion

Initially, it was hypothesized that there would be a strong correlation between the two variables, as the video game experience of high schoolers could be greater than those of elementary students, but the results showed the opposite: that the correlation was weak. This was seen by the similarity in data from all 3 groups; the participants scored relatively the same in all categories, no matter their group. This can be seen in the data for detour rate, the inexperienced group had better scores than the more experienced participants. Although this can indicate that the correlation between both variables is non-existent, what can be concluded is that the AP science students all had similar spatial cognition levels, despite their differences in experience. These results do not strictly align with the findings of De Castell et al., (2015) or Van Dun et al., (2021); it showed somewhat of a middle ground between the two researchers (between no correlation and a strong correlation). The lack of alignment could be a result of the students' limitations: time constraints and the limitations of the students. A limiting factor could be the use of AP students, limiting the participant range to those who, presumably, have a higher spatial cognition to show the influence of video games. Another limitation would be the time constraint, which limited the total data set, and possibly limited the conclusions of the experiment.

Conclusion

In conclusion, this study revealed and clarified a correlation between video game experience and spatial cognition among AP science students. These findings place a further emphasis on identifying methods of increasing the STEM aptitude of students. While the development of the STEM field has hastened as its emphasis and impact are acknowledged, students continue to struggle in this new STEM-focused society. However, the homogeny between the scores of inexperienced and experienced participants indicates that another aspect is required for students to improve their scores. As the future looks to the STEM field, we need to continue researching abilities that influence the performance of students by examining spatial cognition or other spatial abilities. Additionally, the similarities in spatial cognition provide another emphasis on future research into video game experience and its applications to other fields besides STEM.