LEARNING THROUGH GAMING: UNDERSTANDING THE EFFECTS OF EEK! VIDEO GAME ON LEARNING OUTCOMES

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INTRODUCTION

BU Engineering Center in Cellular Metamaterials (CELL -MET) created an Engineering Engagement Kit (EEK!) game and an accompanying content video, both based on their work on the reconstruction of functional heart tissue.

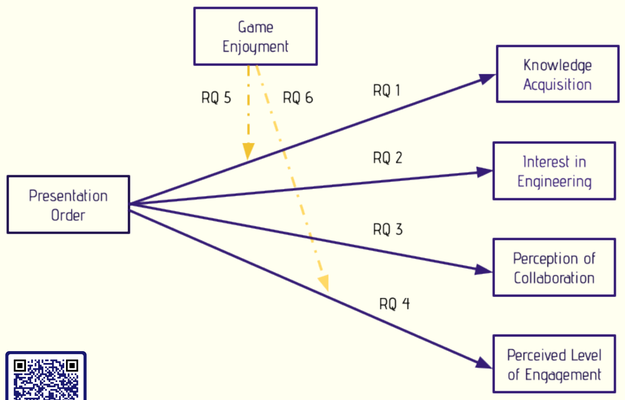
The current research examines how the presentation order of this game and content video impacts retention of informational content, curiosity about engineering, and appreciation of teamwork.

THEORETICAL FRAMEWORK

Excitation Transfer Theory states that the arousal from the first activity can be carried over into subsequent stimuli (Zillmann, 1996).

Transfer Theory states that skills or knowledge that are received in one context can be applied to a different, yet similar context (Lieberman et al., 2014).

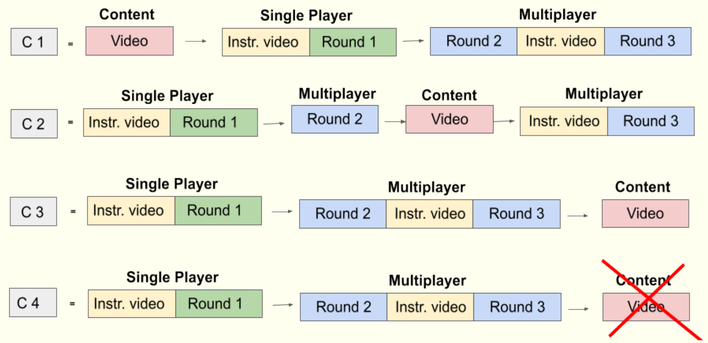
CAUSAL MODEL



References

METHODS

Presentation order of the content video was manipulated in a between-subjects experiment design with 4 conditions.
Participants were exposed to the **content video either at the beginning, middle, or end of the gaming** experience in three treatment conditions. Participants were not exposed to the content video in the control condition.



Participants recruited from **non-science fields** (n = 40, 20 pairs)
Data on **knowledge acquisition**, **perceived collaboration of players**, **perceived interest in engineering**, **level of game engagement** and enjoyment from the EEK! game was collected through self-report measures.

QUANTITATIVE RESULTS

RQ 1:Not significant
$F(3, 36) = [0.736]$, $P = 0.537$

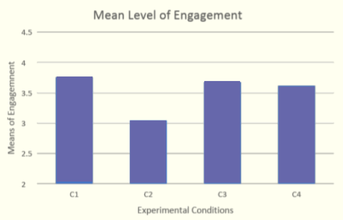
RQ 2:Not significant
$F(3, 36) = [0.693]$, $P = 0.562$

RQ 3: Significant
$F(3, 36) = [3.63]$, $P < 0.05$

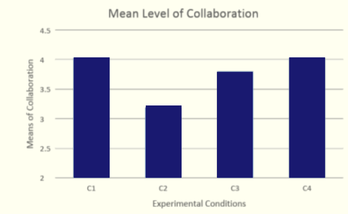
RQ 4: Significant
$F(3, 36) = [3.43]$, $P < 0.05$

RQ 5: Not Significant
$F\ (3, 35) = [3.758]$, $p = .525$, $\eta 2 = .0044$

RQ 6: Significant
$F\ (3, 35) = [3.443]$, $p = .027$, $\eta 2 = .0026$



Engagement level score is significantly different between C1 and C2 ($p < .05$, 95% C.I. = [.06, 1.36]).



Collaboration level score is significantly different between C1 & C2 ($p < .05$, 95% C.I. = [.07, 1.62]) and between C2 & C4 ($p < .05$, 95% C.I. = [-1.65, -.05]).

QUALITATIVE RESULTS

Participants seemed to retain information from the content video after gameplay

Participants seemed to have increased interest in engineering after gameplay.

95% Of the participants felt the game aided collaboration.

Participants said EEK! was engaging and held their attention.

95% Of the participants felt that collaboration with game partner contributed to enjoyment of the game.

Participants said gameplay elements like task completion, color coordination and timed competition kept them focused.

DISCUSSION

Presentation order → Knowledge Acquisition

Presentation **order did not have an impact on knowledge acquisition**. Transfer theory suggested a relationship between these variables, but this was not observed within this study.

Presentation order → Interest in Engineering

Presentation **order did not have a significant effect on interest in engineering**. This suggests that order of presentation does not likely impact excitation transfer to interest in engineering.

Presentation order → Perception of Collaboration

Perceived **collaboration was highest when content video was shown first**. Perhaps, collaboration was aided by better understanding of the content when it was introduced prior to gameplay. Lowest levels of percieved collaboration were reported when content was shown in-between and at the end of gameplay.

Presentation order → Level of engagement

Level of **engagement was highest when content video was shown before gameplay**. This could be because the content video's narrative outlines the purpose and goals of the game. The lowest engagement scores came when content video was shown in between gaming. The video's interruption of gameplay might have fragmented the gaming experience.

CONCLUSION

Our research suggests that **introducing content before gameplay is most conducive for engagement and collaboration** while playing EEK! game.

Perceived engagement was significantly impacted by presentation order with and without controlling for enjoyment from the game. This suggests that presentation order has a main effect on level of engagement.

Future research should attempt different operationalizations of learning outcomes to examine if percieved engagement can be a potential mediator between presentation order. Also, future studies could explore the possible transfer of excitation through biometric measures.