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Identifying and Coding STEM Interest Triggers in a Summer Camp

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Abstract: Our work investigates interest triggering, a necessary component of sustaining and developing long-term interest in STEM. We gathered interview data from middle school aged learners (N = 7) at a science-focused Minecraft summer camp over a period of one week. We first identified STEM interest triggering episodes, then categorized each episode based on codes developed previously by Renninger and Bachrach (2016). Our initial findings show differences in the frequency of interest triggering episodes across individuals and suggest that *personal relevance* and the use of Minecraft played prominent roles.

Keywords: videogames, technology, summer camp, interest development, STEM learning

Introduction

Our research examines how interest, operationalized as a psychological construct and motivational variable (Renninger & Hidi, 2016), can be identified in student interviews regarding their experience in a science-themed summer camp. We define interest as heightened attention and engagement, as well as continued voluntary re-engagement with subject matter (Hidi & Renninger, 2006). We build on and address the gaps within existing work about interest triggering in out-of-school learning settings. Renninger and Bachrach (2015) analyzed interest triggers of middle school-aged learners in an out-of-school biology workshop where they elaborated on a five-step content analysis on existing interest literature and theory. This work produced eight codes describing triggers for interest within the science workshop context: *autonomy, challenge, computers/technology, group work, hands-on activity, instructional conversation, novelty*, and *personal relevance*. They adopted literature from different content areas, such as reading, for the science workshop context. In this paper, we use the same approach, but in the context of a STEM-focused summer camp that leverages Minecraft as the primary learning environment.

Our study is a contribution to the examination of interest triggers within a digital learning environment, a field of research still in its early stages. We utilize the popular video game, Minecraft, for participants to explore, to make observations, and to ask questions about hypothetical versions of Earth customized by our laboratory (refer to Yi et al., 2018; Yi et al., 2020). Minecraft provides an ideal space for our work because of the variety of science concepts that can be conveyed through the game, as well as being a space to collect data and conduct research on how gameplay reflects interest (Lane et al., 2017).

Methods

Participants were recruited from a local youth center for a five-day STEM-focused summer camp in 2020 (N = 7; 43% female; M = 12 years old). The majority of participants self-identified as African American (4) while others identified as biracial (2) and White or Caucasian (1). Due to the pandemic, we adapted our usual face-to-face intervention to a hybrid form of staff and participants attending in-person and the research team attending remotely. One-on-one interviews were conducted in a separate Zoom breakout room on the last day of the intervention. The interview protocol for middle school students consisted of 16 questions and covered topics on home and school life, long-term interest, Minecraft play preferences, astronomy knowledge, and camp feedback.

Analysis

Two researchers sectioned interview data into STEM interest triggering episodes, using the *unknown* label for codes that did not fall under the coding scheme. *Unknown* interest triggering episodes will undergo thematic analysis to create new codes or subcodes that wholly capture the out-of-school science learning experience. Each episode is distinguished by a particular interest topic. For example, when asked about engagements with science content, the interviewee may report how much they enjoyed their latest trip to a science museum, then relate the science museum experience to an enjoyable classroom lesson in the past.

Inter-rater Reliability (Cohen's Kappa)

In the identification of interest triggering episodes, there was a substantial agreement between the two researchers, $\kappa = .73$. All disagreements were resolved in conference. There was an almost perfect agreement

between two researchers when using Renninger and Bachrach's coding scheme based on two interviews, κ = .94. All disagreements were resolved in conference.

Findings

Each STEM interest triggering episode was then coded using Renninger and Bachrach's (2015) scheme for interest triggers (see Table 1). Columns where interest triggers occurred are highlighted in orange.

Table 1: Interest trigger counts (in columns) based on Renninger and Bachrach (2015) codes

#	Auto-nomy	Chall-enge	Comp/ Tech	Group work	Hands-on activity	Instructional conversation	Novelty	Personal relevance	Unknown
701	0	0	0	0	0	0	1	2	3
702	0	0	1	0	0	0	1	4	6
703	0	0	2	0	0	2	0	4	2
704	0	0	1	0	0	0	4	4	2
705	0	0	1	0	0	2	0	8	2
706	0	0	2	0	0	0	3	5	4
708	0	0	2	0	0	0	0	5	3

Conclusions and implications

Our preliminary results show a prominent role for *personal relevance* which specifically relates to Minecraft use by using a familiar platform to build on prior knowledge, such as experiencing a difference in gravity (a previously learned concept) on the Moon. *Personal relevance* also relates through a desire to reengage in camp content—choosing our server instead of outdoor play during free time—and when expressing positive affect regarding future participation of camps. One advantage of using Minecraft is the capability of most learners to immediately engage the science content due to the game's relevancy and familiarity through previous play. Another reason for the high frequency of personal relevance triggering episodes may be related to the design and structure of our intervention that evokes feelings of personal relevance within the activities.

There were several interest triggering codes without any instances (i.e., *autonomy, challenge, computers/technology, group work, hands-on activity*). This may be due to the wording of our interview questions and/or the structure of our camp. Another possible reason is that we followed Renninger and Bachrach's coding scheme strictly and only allowed one type of code per episode. Future research designs using the coding scheme by Renninger and Bachrach (2015) should consider the use of multiple codes per episode.

References

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, *41*(2), 111–127. https://doi.org/10.1207/s15326985ep4102_4

Lane. H. C., Yi, S., Guerrero, B., & Comins, N. (2017). Minecraft as a Sandbox for STEM Interest Development: Preliminary Results. In Hayashi, Y., et al. (Eds.), *Workshop Proceedings of the 25th International Conference on Computers in Education* (pp. 387-397). New Zealand: Asia-Pacific Society for Computers in Education.

Renninger, K. A., & Bachrach, J. E. (2015). Studying triggers for interest and engagement using observational methods. *Educational Psychologist*, *50*(1), 58–69. http://doi.org/10.1080/00461520.2014.999920

Renninger, K. A., & Hidi, S. E. (2016). *The Power of Interest for Motivation and Engagement*. New York: Taylor & Francis. https://doi.org/10.4324/9781315771045

Yi, S., Lane, H. C., & Delialioğlu, O. (2018, August). What if we were twice as close to the Sun? Interview findings from a science summer camp serving underrepresented youth. In F. Khosmood et al. (Eds.), *Proceedings of the 14th International Conference on the Foundations of Digital Games*. San Luis Obispo, CA, USA: Foundations of Digital Games.

Yi, S., Gadbury, M., & Lane, H.C. (2020, June). Coding and analyzing scientific observations from middle school students in Minecraft. In M. Gresalfi & I. S. Horn (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 3* (pp. 1787-1788). Virtual Nashville, TN, USA: International Society of the Learning Sciences.

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