

In Pursuit of Creativity in *Minecraft*: A Mixed-Method Approach

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Abstract: Despite *Minecraft*'s incredible popularity, we know very little about how the game might enable creativity. To assess and support the creativity of the structures that players create in *Minecraft*, we need to understand how Minecrafters describe creativity in their communities, and how similar or different those descriptions match the creativity literature. In this study, we used a modified rubric for creativity and investigated if we could find evidence for this rubric in how *Minecraft* builds are being evaluated in YouTube. We also used natural language processing (NLP) to develop automatic coding algorithms for future use. Insights here would inform the literature, research, and educational practices of creativity.

Introduction

Creativity is one of the essential skills for success in life in the 21st-century (Gray, 2016; Glaveanu et al., 2020). In our ever-changing world, we need people to think, feel, and act creatively to solve new or unexpected problems (Resnick, 2018). Since the beginning of the COVID-19 pandemic, creativity has been quintessential to designing effective vaccines (e.g., Tan et al., 2021) and sustaining economic infrastructures. For instance, restaurants, schools, and businesses have had to come up with creative means to remain open. Because creativity is valuable to society, attention has been placed on understanding the various ways creativity manifests in everyday life, the so-called *little-c* creativity (Kaufman & Beghetto, 2009; Richards, 2010)—the focus of this study. To assess *little-c* creativity, researchers use divergent thinking to examine creative thinking or creative potentials (Runco & Acar, 2012). Guilford (1956) operationalized divergent thinking using its four facets: *flexibility* (e.g., the number of categories or themes used when solving a problem or the ability to come up with relevant ideas from different categories or themes); *fluency* (the ability to produce a large number of relevant ideas); *originality* (the ability to produce statistically rare ideas); and *elaboration* (the ability to implement and expand on an idea in detail and high quality).

One promising medium to assess and enhance creativity is video games (e.g., Rahimi & Shute, 2021a; Shute & Rahimi, 2021). This is because video games, in their ubiquity, reach broad audiences all around the world (Rahimi & Shute, 2021). Through the often-repeated practices, people obtain creative skills that may transfer to other parts of life, thus enhancing their overall creativity in life (Green & Kaufman, 2015). Well-designed video games may enable people to practice being creative (Rahimi & Shute, 2021b). To support creativity in video games, one must first accurately assess it, however, assessing creativity is challenging. For instance, assessing creativity could be subjectively in the eyes of the beholder. Some researchers have even suggested we need to drop the idea of objectively assessing creativity (Amabile, 1996). However, others have used new assessment techniques such as stealth assessment to objectively (i.e., automatically) assess creativity (Shute & Rahimi, 2021). Stealth assessment uses log files generated in an immersive environment (e.g., digital games) to make inferences about learners' level of competency on the skill at hand (e.g., creativity). Before a stealth assessment is designed and embedded in a digital game environment, it is essential to find appropriate indicators in the assessment or learning environment (e.g., a digital game) to provide evidence for the competency of interest (e.g., creativity).

One of the most popular games of all time is *Minecraft* (Gilbert, 2018). *Minecraft* has shown promising results in improving people's creativity (e.g., Blanco-Herrera et al., 2019). *Minecraft* includes five modes of gameplay: creative, survival, adventure, spectator, and hardcore. In the creative mode, players usually create various structures (e.g., a recreation of real-world buildings, creating fantasy worlds). These structures have been showcased online via various platforms such as YouTube which consistently ranks *Minecraft* as one of the most popular terms searched on the platform globally (Hardwick, 2020). In fact, others have fruitfully leveraged YouTube to examine *Minecraft* productions (Walker et al., 2019) to find out how they are represented and constructed at scale. Therefore, YouTube content about *Minecraft* has a lot of potential for creativity researchers to investigate how creativity is manifested in this video game.

To assess and support the creativity of the structures that players create in *Minecraft*, we need to understand how Minecrafters describe creativity in their communities and how similar or different those descriptions are compared to the classical creativity definitions in the literature. Among the YouTube videos about *Minecraft* are some videos created to showcase and evaluate top *Minecraft* constructions created by others that

could be classified as creative (e.g., top 10 constructions in *Minecraft*). These videos usually have a voice-over describing why those 10 builds, for example, are among the top *Minecraft* constructions. The evaluators' descriptions could potentially include the language used to describe creativity discussed in literature. In this study, we will focus on analyzing the evaluative videos' transcripts to address the following research questions:

- 1) *To what extent the YouTube-based Minecraft evaluators' comments are consistent with our rubric of creativity (see Table 1; adapted from Rahimi, 2020)?*
- 2) *Are there new facets of creativity emerging in how Minecraft content evaluators describe creative structures on YouTube?*

Insights here would extend our understanding about the ways creativity manifests in online, sandbox video games such as *Minecraft*; thus, enhance learning-interventions and assessment of creativity in the future.

Method

The current study uses a combination of traditional deductive and inductive qualitative coding (Ravitch & Carl, 2019) and natural language processing (NLP) to examine the transcripts of a set of evaluative *Minecraft* videos hosted on YouTube. We specifically looked for patterns of common descriptions of creative constructions in the video transcripts and categorized them into the seven categories defined in Table 1. We also looked for new emerging categories if any.

Table 1
The Initial Codes for Creativity in Minecraft

Code	Description
Elaboration	The amount of detail. Any time the evaluator remarks on a Minecraft build in terms of the level of detail regarding the materials, mechanics.
Originality	How rare is the building? Any time the evaluator refers to the construction being unique, rare, or states something similar referring to the building being novel.
Aesthetics	Is it aesthetically pleasing? Well-thought-out designs, symmetrical elements, great choice of color?
Surprise	Was there any sense of surprise in the evaluator's narration? If the narrator was amazed, impressed, wowed.
Humor	Was there any laughter in the evaluator's narration? This the evaluator used words such as "funny" or even laughed like "hahahah" or "hilarious"
Complexity	refers to ideas from different categories. If the narrator referred to Variation of shapes, colors. Combining different elements in the building.
Novel use of materials	If the narrator refers to the use of a material in an unusual way.

Selection of videos

To find the most appropriate YouTube videos, we first consulted with two *Minecraft* experts (with more than three years of experience in *Minecraft*), and then we came up with appropriate search terms and video selection criteria. The search terms included "Minecraft builds" "top Minecraft buildings" "best Minecraft constructions" "top ten" "top five" "Minecraft" and "creative." Our search terms and inclusion criteria yielded thousands of results on YouTube. After several iterations, we developed the criteria to only include videos that had narrations. In addition, we included videos evaluating *Minecraft* builds and excluded videos about competitions or about the other *Minecraft* modes (e.g., survival). With the criteria, each author created a list of videos with the YouTube links they found. After individual screening and consulting with our *Minecraft* experts, we collectively selected a sample of 61 videos. Then, three authors went through an additional screening to determine the duplicates and apply the inclusion/exclusion criteria until 100% consensus was reached. The final data set included a collection of 36 videos (about 360 unique builds in our analysis). Next, we briefly explain how we extracted the transcripts.

Extracting the transcripts

Using YouTube's publicly accessible application program interface (API), we wrote a code to read the YouTube URLs from a Google spreadsheet, extract each video's transcript, and generate a dataset with all the transcripts

for each video in it. The variables in that dataset included: video ID, caption (as they would appear on the screen), time stamp, and duration for each caption. Our final dataset included 14,860 lines of caption.

Coding process

For this study, which is a work-in-progress, we chose the first two videos in our dataset (20 builds), created three separate spreadsheets for each of the authors, and applied the codes in Table 1 to this unit of analysis. Codes were applied deductively to the transcripts. We also inductively reasoned on parts of the transcripts that could be coded as a new category but were not captured in our existing codebook. In doing this we identified themes that were then consolidated into a formal code (see Table 2). Codes were not mutually exclusive and could co-occur in each excerpt. In the first round of coding, three authors independently coded a subset of the transcripts and met to compare and resolve code application disagreements until 100% consensus was reached. To get a sense of code distribution for each build and across the entire sample we generated descriptive statistics in the form of frequency counts per code. In addition, we invited another author, who has expertise in learning analytics to help us understand and focus on connecting human codes with NLP and machine learning classification algorithms. Developing an NLP model can help us automatically code transcripts of similar videos in the future at scale.

Results

In the process of coding, we developed two new codes: (1) *effort* referring to how much effort it seemed a build took to be created. For example, “almost a full year of work was put into bringing this creation to life” was coded as evidence for effort. We found ten incidents for effort in the ten builds we coded; and (2) *realism* which refers to how real the build was in evaluator’s view. It is hard to create real-looking constructions using blocks in *Minecraft* because the scales should be accurately estimated, and it takes a lot of detail. Therefore, when a building resembles a real building, the evaluators found it as doing something creative. We found 28 incidents for realism in the ten builds we coded. The rest of the codes’ appearance are listed in Table 2. The most frequent codes were elaboration, aesthetics, surprise, and complexity. We have not found any explicit statements to be coded for humor in the ten builds that we coded. However, it is too soon to decide if we need to drop these codes as we still have about 34 videos to code.

Our preliminary analysis using NLP and machine learning classification algorithms revealed insights about the possibility of automated creativity evaluations. We achieved close to 70% accuracy (using 5-fold CV) to distinguish the sentences that showed evidence of creativity. Similarly, close to 90% accuracy was acquired to categorize the sentences based on the proposed dimensions of creativity. We used a logistic regression algorithm and a multi-label adapted kNN classifier with the term-frequency inverse document-frequency vectorization.

Table 2

The Initial Codes for Creativity in Minecraft

Code	Frequency	Example for the Captions
Elaboration	39	“Wow look at the details” “this is a very dense design”
Originality	15	“I have not seen something like this before” “This is a unique built”
Aesthetics	30	“Wow, this is beautiful, look at the colors!” “Such a symmetrical shape”
Surprise	44	“Wow, this is really unexpected!!” “Can it get even more complicated?”
Humor	0	“Wow, this is funny!” “This looks really hilarious” “Hahahaha this reminded me of...”
Complexity	13	“This is a complex design as the builders combined multiple materials”
Novel use of materials	3	“Look, they used a torch as the eyes of the devil”
<i>Effort</i>	10	“Almost a full year of work was put into bringing this...”
<i>Realism</i>	28	“... a highly detailed recreation of The Lord of the Rings.”

Discussion & Conclusion

In this study, we used a modified rubric for creativity and investigated if we could find evidence for this rubric in how *Minecraft* builds are being evaluated in YouTube. Due to lack of time for this proposal, we have so far coded the caption related to 20 builds. We found evidence for most of the codes or sub-facets of the rubrics we used except for humor and novel use of materials. We also found two new codes: effort and realism. These codes are significant because they highlight how platform-specific features shape how creativity manifests itself. In other

words, creativity codes can in many ways be generalized, however, video games and their diverse context may manifest creativity in different terms. Because of our small sample of builds so far (only 20 builds) we cannot make a conclusion about which code has appeared more compared to the other codes. However, it is noticeable how often surprise, elaboration, aesthetics, and realism appeared in the captions from those 20 builds.

Moreover, our NLP analysis and classification algorithms could successfully identify the syntactic and semantic differences among the creativity dimensions. However, the analysis was conducted with a relatively small set of sample sentences for both training and evaluation, which may limit the generalizability of the findings. Hence, we encourage a future focus on expanding the labeled dataset to evaluate the capacities of our algorithms for automated coding.

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