A Scaled Analysis of How Minecraft Gamers Leverage YouTube Comment Boxes to Participate and Collaborate

Justice T. Walker, Stefan Slater, and Yasmin B. Kafai
justicew@upenn.edu, slater.research@gmail.com, kafai@upenn.edu
University of Pennsylvania Graduate School of Education

Abstract: Minecraft—a commercially successful and popular sandbox game—is increasingly used in formal educational spaces. While there is significant research on how online gaming can support positive outcomes when used as a pedagogical tool, little research has investigated how gamers collaborate to learn in informal spaces. We conducted an analysis of a curated subset of more than 540,000 comments of Youtube videos to explore how users participate and practice in discussions about Minecraft where comment boxes are the primary method used to communicate about video content. Our findings reveal that gamers use online comment sections for multiple reasons, from participating in shared social experiences unique to Youtube as a community to giving myriad forms of feedback to learn and further content development. In our discussion, we address the ways other online game platforms can better support learners seeking out information and collaborating in ways that are constructive and inclusive.

Keywords: Gaming, Metagaming, Feedback, Participation, Minecraft

Introduction

Much research has focused on learning and collaboration while playing (Connolly et al., 2012; Clark et al., 2016) and making digital games (De Freitas, 2006; Basawapatna et al., 2010), which has collectively pointed to the influence games have in supporting positive outcomes in academic content areas (e.g., language arts, computer science, mathematics) and skills (e.g., literacy, problem solving and argumentation). These outcomes have been especially promising for education efforts designed to support broader access to science fields where social and intellectual participation disparities exist. Alongside these efforts is research that attends to learning and collaboration in massive multiplayer games where game elements and social interactions are complex and more difficult to ascertain (Paraskeva et al., 2010). Examples include commercially successful games like the role playing-based World of Warcraft (Clark et al., 2009), the simulation-based SimCity (Tanes and Cemalcilar, 2010), and the open narrative-based Minecraft (Nebel et al., 2016) where gamers can interact on massive server networks that are globally distributed.

With more than 100 million registered users, Minecraft is an example of a game where users are able to collaborate to make and play games (Makuch, 2014). In Minecraft, players use tools and materials to build complex structures that can be automatized or programmed, especially through the use of third-party game modifications (mods). YouTube has become a popular metagaming environment for Minecraft by providing an online open access video platform where content creators have posted more than 70 million Minecraft tutorials videos publicly. In fact, Minecraft-related searches on Youtube represent the second most commonly searched term on the video platform (Thompson, 2016). Prior research of this environment examined a small number of Minecraft player Youtube video producers to understand the nature of user interactions (Niemeyer and Gerber, 2015). Findings suggested that this online video platformed represented—in broad terms—a "collaborative learning community" that supported constructive engagement among players. While these findings offer important justifications for further research on how collaboration takes place in this metagaming space, few research (Niemeyer and Gerber, 2015; Anderson et al., 2017) studies have focused on learning outside of gaming environments and in digital spaces that develop around games— the so-called metagaming spaces (Gee, 2008). Gee and others have argued that more learning happens in these contexts and communities than in traditional learning spaces. However, research of these spaces is difficult: metagaming environments generally operate on private web servers (e.g., personal networks or in-game chat systems) or are distributed across physical environments (e.g., conferences, camps, festivals, etc) that represent only a small fraction of the total number of community members that participate in a given game. As a result, it has been difficult to research these contexts at scale. In this study, we use natural language processing (NLP) approaches to characterize and make sense of the complex ways Minecraft gamers participate and provide feedback when using video tutorials and comment sections. We ask: (1) what modes of participation are used by Minecraft players in the comments section of Youtube? (2) what forms of feedback do Minecraft users provide when using Youtube? and (3) what

are the affordances and constraints of using online video platforms to participate in feedback? In the discussion, we address the ways online game platforms can better support accessible and equitable learning and collaboration in game environments that are self-directed as well as directions for future research.

Background

Collaboration in gaming

In learning, collaboration has been described as moments when learners and/or experts come together to share ideas, feedback, and attention toward a shared understanding or goal (Davis et al., 2018). The relationship between collaboration and learning has been conceptualized using constructivist perspectives that describe learning as a social interaction where so-called novices and experts come together to learn from one another. In this theoretical trajectory, digital games can be understood as communities of practice as players of different mastery levels convene around a common interest (Lave and Wenger, 1991). It is within these communities where collaborations guide interactions and support learning. There are a number of collaborative arrangements in digital game environments that positively support these outcomes and that have been shown to be instrumental in important cognitive processes including reflection.

One collaborative arrangement that has been shown to be especially effective involves situations where learners provide each other feedback (Butler and Winne, 1995; Plass et al., 2015). This has been effective in traditional learning research in literature, mathematics, and computer science. Feedback has also been examined in digital game platforms. Research in this area has shown that collaborative feedback has supported (civic) engagement, knowledge building, and skill building and across a range of subject areas. While most studies examine collaborative feedback while playing games, this research explores a new genre of game platform that combines game play and construction. In this form, gamers not only engage in play, but they also have opportunities to build and modify game environments, characters and objectives.

Minecraft is an example of this type of game and is the frame within which this research examines collaboration and feedback. Platforms like Minecraft have previously been described as among the most promising game-based approaches to support learning (Gee, 2008; Plass, 2015). However, education research that explores the ways Minecraft can support learning is scant (Nebel et al., 2015). Existing research has described ways the ways Minecraft can be utilized in K-12 learning environments to teach mathematics concepts (Short, 2012), in-game collaboration tactics (Marklund et al., 2013) and collaborative design (Cipollone et al., 2014; French et al., 2016). Research has also assessed collaboration differences in underrepresented minority groups (Ames & Burrell, 2017), and small-scale analysis of collaboration techniques for learning (Wernholm & Vigmo, 2015; Davis et al., 2018) among young players.

Collaboration in metagaming

While these studies provide important insights into the nature of collaborations among diverse players, much less is known about how gamers collaborate in spaces outside the actual game platform—Minecraft's metagame environments. Because these environments play a significant role in supporting learning outside of Minecraft (Bebbington, 2014), understanding the ways gamers collaborate in these spaces provides perspectives that are not always apparent in the game environment. Although research has shown that feedback benefits collaborative learning arrangements, adverse outcomes have also been identified. Some of these outcomes include inequitable participation where only a few learners benefit from learning outcomes associated with feedback-driven collaboration (Ames and Burrell, 2017). Other adverse outcomes occur when feedback is not constructive or is not used to drive reflection. Because of challenges related to access and scale, little research investigates the myriad ways in which learners engage in feedback in digital games or their associated metagaming environments.

Videos on Youtube can provide an important insight into the nature of collaboration in the metagaming space. Minecraft players post millions of videos on YouTube showcasing their play experience or explaining particular concepts. Minecraft related topics on Youtube include instructions for making and applying 'skins' (changes to the physical appearance of a Minecraft avatar), strategies for mining and obtaining resources, redstone networks based on computational circuits and logic, and 'modding' (third-party code that adds additional game functionality).

Previous research that examined thousands of comments in the online youth programming community Scratch (Fields et al., 2015) found that players were able to provide constructive feedback. However, within the Scratch online community, the commenting feature is integrated within the environment and thus not a traditional metagaming location. Youtube videos are a traditional metagaming location, but the traffic served by the website is multiple orders of magnitude larger. To overcome this challenge, we use a bag-of-words

approach—specifically keyword spotting (Cambria and White, 2014)—to curate, collect and analyze moments of user collaboration in order to provide a scaled insight into collaborations that occur in these comment spaces, the collaboration affordances and constraints that exist using online video platforms, and ways to support constructive collaborations in similar online video-based meta game environments.

Methods

Data were collected in September 2018, from the comment sections of a sample of videos posted to Youtube. In order to generate our sample of videos, we first developed a list of search terms related to different actions and behaviors within Minecraft that users might want to engage with. We used Youtube's public application program interface (API) to write a Python script that returned the top 50 video results for each of our search terms, detailed in the next section. We used the video identification (IDs) obtained from this process to collect every comment left on each of the sampled videos. This process yielded more than 540,000 unique comments. From this sample we performed qualitative coding using an inductive approach (Ravitch and Carl, 2015) in order to identify a subset of terms relevant to learning and social engagement. This yielded a sample of more than 27,000 unique comments. Of this sample, we randomly selected a subset of about 100 and developed a ground-up codebook to describe how Youtube users participate and collaborate with one another when using the comments section to learn. We then applied these codes to a random set of 518 unique comments drawn from the 27,000 comment sample. In the following section, we detail our specific video sampling criteria and subsampling techniques.

Video selection

We searched Minecraft-related videos based on nine search terms encompassing a number of popular approaches to playing. For each search, the top 50 video results according to Youtube's relevance algorithm were selected. From these videos, every comment was recorded along with the author, the date posted, the content of the comment, and the number of likes/replies the comment received. To collect comments related to 'skins,' we searched for videos using the search terms 'minecraft how to skins' and 'minecraft skins tutorial.' For mining, we used search terms 'minecraft how to mine' and 'minecraft mining tutorial'. For 'Redstone,' we used the search terms 'minecraft how to redstone' and 'minecraft redstone tutorial.' Finally, we used the search terms 'minecraft best mods', 'minecraft how to mod', and 'minecraft mod tutorial' to search for videos related to the modding process in Minecraft.

Subsampling the dataset

Including several videos collected during our code testing, our dataset included 433 unique videos and 546,034 unique comments. Due to the size of this dataset, we generated several smaller datasets to make qualitative coding approaches feasible. We performed this dataset reduction in two steps. We first selected all comments from the dataset that were either liked or replied to at least once. These criteria allowed us to select for comments that showed some level of social engagement. This yielded two datasets—52,775 'liked' comments and 37,930 replied comments, respectively. In the first dataset, 21,441 comments were liked more than once, and the maximum number of likes received by any comment was 9,228. In the reply dataset, 18,334 comments were replied to more than once, and the maximum number of replies received by any comment was 7,460.

We used these two datasets to perform preliminary inductive coding, in order to identify how Youtube users engage with Minecraft, and how collaboration and learning within the comments might be operationalized. From this preliminary coding, we identified a set of 11 key words and phrases that appeared to be associated with a deeper level of engagement in the content. These keywords included 'figure out' (433 comments), 'turn out'/'turns out' (55), 'I found'/'I have found' (1,849), 'because' (8,440), 'I think' (4,381), 'I can' (6,791), 'how do' (4,371), 'how can' (656), and 'learn to'/'learn how'/'learn about' (176).

Finally, we performed both inductive and deductive coding on each of these keyword datasets. For datasets containing more than ~100 comments, we selected random samples of 100 comments from within them to code. We used an inductive coding approach to identify both common themes of discussion on Youtube, as well as social norms and platform-specific memes that users engage in. Deductive coding was used to identify the degree to which a comment was emblematic of involving feedback or social participation.

Findings

We report finding about the forms of participation Minecraft gamers use when using the comments section on Youtube tutorial videos. We also report on the various ways Minecraft gamers use feedback to collaborate and participate. Unless otherwise stated, these codes were not mutually exclusive and could co-occur.

Finding 1: Minecraft gamers mostly: use comments to participate, reference in-game activities, and engage Youtube video producers

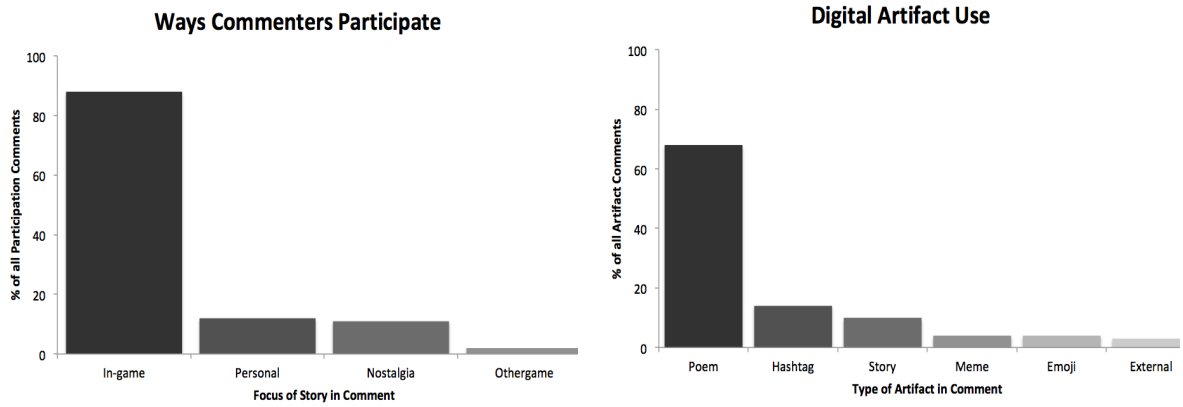
Of 518 Youtube comments assessed, 346 involved some form of social participation with other people. This could involve either sharing personal experiences from playing Minecraft, or it could involve conversations with video authors or other users on Youtube.

101 of these participation comments were coded as involving *ways that Minecraft gamers participated*. These results are summarized in figure 1a. Unsurprisingly, in-game references (88%) represented the largest form of participation. These were moments when gamers made reference to experiences either playing Minecraft or engaging with Minecraft. For example, one commenter explained, "So aswome because I don't mine at night any more.but when I go in the day, it turns out night when I get out an have to sprint to get to my house." Here the user is using the comment box to describe their strategy during play after viewing a related tutorial. References to personal experiences (12%) also occurred and represented instances when gamers mentioned personal life experiences that were not directly related to Minecraft. For example, a video reminded a commenter of sleepovers with a friend, "I first heard this 4 years ago when my friend came over and introduced me to minecraft. 4 years later and I have found the song. OMG so much nostalgia. Plus also nostalgic because it reminds me of all the sleepovers I had with the friend." In this example, it can be seen that personal stories often overlapped with nostalgia (11%), which was represented in moments when gamers made reference to or recollected a time in the past. Finally, the smallest set of comments represented instances when gamers used comment boxes to reference to other games (2%).

201 comments were addressed to a particular audience, and explicitly social in nature. The majority of these comments were directed toward Youtube video producers (53%). For instance, as one commenter used the comments to solicit help from the video author directly, saying "I really wanted a mod but it turns out ur tutorial doesn't work for me when I Vick ur link it takes me to a different forge pls answer me." Other commenters (13%) and Minecraft game players broadly (2%) were also focal points of engagement in comment boxes as commenters would ask others to describe their own experiences or refer to other gamers on Youtube about Minecraft experiences. Finally, we coded for unclear or ambiguous participatory comments, instances where it was not possible to determine to whom the engagement was directed. For instance, the comment "you know what do you have a server ? because there is a cool game its called egg wars:D" could be directed either at a video author or another commenter.

96 comments referenced Youtube as a platform and its various design affordances. Comment codes (85%) included references to using Youtube's comments section as a site of shared participation, such as requests to "start a comment chain" around a particular idea or behavior in the video. This represented the largest percentage of participation forms gamers used on Youtube. References to comment or video "likes" (7%) are instances where the commenter refers to the number of likes a video has or encourages other users to like/dislike a particular video. Technical references (6%) were also observed and were instances when gamers referenced a technical aspect of Youtube such as lag on a video or a missed notification. References to subscribing (5%) to a video were also observed and involved mention of the subscribe feature of a Youtube video channel. These comments were often solicited by the author (e.g., "SUBSCRIBE!!!") in order to grow a viewer audience base. Notifications (1%) were infrequently observed and represented instances when a gamer refers to being notified (or not) about video content on Youtube. Similar to subscribe references, these typically represented moments when commenters signaled wanting to be a part of or being a part of a viewer audience and stay up to date on new content.

Finally, 80 comments included digital artifacts of participation beyond simply leaving a comment: poems (68%), hashtags (14%), stories (10%), emojis (4%), memes (4%), and links to external resources (3%). These results are summarized in figure 1b. These represent instances when gamers used atypical representations to participate, such as collaboratively posting lyrics to a song parody, or telling elaborate and embellished stories about a particular behavior.



(a) Various Ways Youtube Comment Metagame Environment Users Participate

(b) Digital Artifacts Used by Youtube Comment Metagame Environment Commenters

Figure 1. Participation Forms (a) and Digital Artifacts (b) Used.

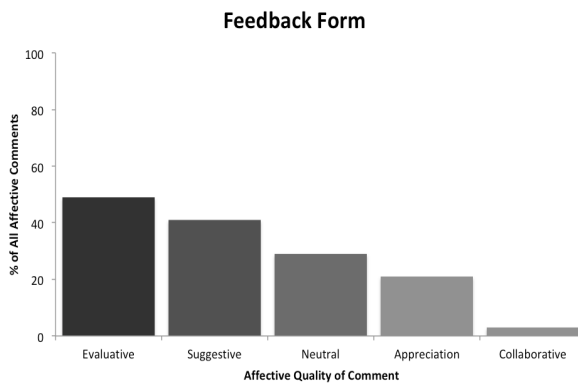
Finding 2: Minecraft gamers mostly use affective and neutral feedback and primarily to assess Youtube video usefulness and functionality

261 of the 518 coded comments involved some form of feedback, with users sharing their thoughts and opinions on video content, video authors, or other commenters, among other topics

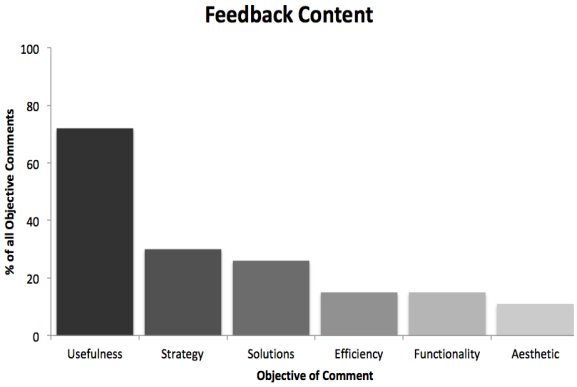
Of this sample, 134 involved comments that referenced specific in-game game features including 'mods' (41%), redstone (37%), mining (19%), building (18%), general play (16%), and 'skins' (7%).

Also, from this sample, 168 comments reflected instances when gamers used the Youtube comment section to provide either affective or social feedback. Feedback that was evaluative (49%) included judgements that included affective features like sarcasm, insults, compliments, or encouragement. Feedback that was suggestive (41%) included moments when commenters suggested ideas for future Minecraft-related tasks, strategies, and/or video content. An illustrative example of this occurred when a commenter remarked, "can you do a customstom command seiries were you learn to make a command block machine and make minecraft a better place to play in :)." Here the commenter is suggesting through request that the Youtube video producer make a specific series of tutorial content. Neutral feedback (29%) reflected moments when commenters provided feedback that did not have an affective quality. This was illustrated when a commenter remarked about the audio being played during a tutorial "shoulve been learn to fight at night," which is a critique about the audio that best represents the tutorial and yet does not explicitly connote any affective judgement. Feedback that was appreciative (21%) reflected moments when commenters asserted thanks because of something related to video tutorial content or the video producer. This type of feedback was evident when a commenter noted, "Thanks for this series seth it is really clear and instructive and i'm really looking up to learn to code turtles makes FTB way easier." The commenter's feedback also goes further to explain the reasons why they appreciated the tutorial. Feedback that was collaborative (3%) in nature demonstrated moments when video tutorials prompted a commenter to solicit video producers or other commenters to collaborate on a common Minecraft related endeavor. Findings are summarized in figure 2a.

Content focused feedback occurred in 112 feedback-related comments. Of these, the majority emphasized video tutorial usefulness (72%) in helping viewers achieve some in-game outcome as illustrated when a commenter remarked, "Hey Mumbo I love your vids and watch them every day! Your redstone tutorials have helped me sooo much and I have actually have been able to build some complicated redstone contraptions because of you! [emojis]" In this case the commenter is underscoring the idea that the video producer's tutorial helped the content viewer achieve a goal - in this case learning to use redstone in complicated ways. These observations are summarized in figure 2b. In addition, 172 involved comments that reflected feedback that was directed toward: content (88%), Youtube producers (11%) and technical video features (3%).



(a) Forms of Feedback Provided on Youtube Metagame Environment Comment Boxes



(b) Feedback Content Provided on Youtube Metagame Environment Comment Boxes

Figure 2. Feedback Focus (a) and Forms (b).

There were also instances when commenters provided feedback about the strategy (30%), solution (26%), and efficiency (15%) of proposed game play. An illustrative example of these occurred when one commenter asserted, "Dude searching all this stuff is slow as hell and less reliable, sure mining sometimes turns out slow but trust me after like 40 minutes I have stacks of materiel and sometimes enough for Diamond Armour." Here, the commenter is providing feedback about the efficiency of a mining strategy and the benefits of using the approach in reference. Feedback related to functionality (15%) reflected moments when video commenters made reference to the function of an approach such as the ability to produce a functional redstone-based product. Aesthetics (11%) related feedback were moments when commenters referred to the aesthetic quality of a video or Minecraft artifact such as—for example—the sound of a song or look of a building as exampled when one commenter noted "I like the song, but i think the vid would be better with the default textures...." The commenter is pointing out the mod used to alter the game environment would have been visually better if the the game's default settings were maintained.

Discussion and conclusion

Here we advance a mixed-methodological approach that uses NLP and qualitative methods to overcome challenges associated with analyzing qualitative data from metagaming platforms at scale. By doing so, we're able to assess the myriad ways Minecraft users participate and collaborate in tutorial-based video content on Youtube. Our analyses show several trends involving the types of feedback and collaboration that occur on this platform.

First, we observed that Minecraft gamers use Youtube to participate in multiple forms of discourse. While comment section discourse represented the most frequent form of engagement in our sample, we also observed song remixing and parodying. This suggests that online platforms support unique cultural norms and practices. We also observed moments where Youtube supported just-in-time, on-demand access to quasi-experts—video content producers that have specialized domain knowledge of a set of Minecraft related features (e.g., redstone, mods, skins, etc.). This underpins important implications for learning at scale in environments where access to domain experts is limited. Here, we observe that metagame communities provide an important space for learners to not only engage with experts in order to achieve learner-centered goals in the game environment, but also to provide feedback on content which these experts should cover.

We also observed that Minecraft gamers frequently use forms of feedback to assess Youtube content. Notably, feedback about Youtube videos primarily focused on game-related content, suggesting that this metagame environment is an important space for (Minecraft) learning—harkening back to Gee's characterization of the ways these spaces support meaningful engagement. Furthermore, commenters most often provided feedback that was evaluative and suggestive. This underpins the prevalence of affective social engagement on Youtube. It suggests that Youtube acts as a place for learners to advance not only their own learning repertoires, but also that of others. Learners very often made unprompted suggestions (both to video authors and other commenters) to advance tutorial content.

Importantly, this research provides important first attempts to elucidate insights into the myriad ways gamers use a metagaming environment experience to participate and productively collaborate while learning.

While Youtube affords opportunities for diverse participation and engagement, important constraints exist. These constraints include the ability for users to participate in discourse beyond those afforded by Youtube's technical features. We observed, for instance, users participating and collaborating in ways that were marginal compared to prominent comment-based and evaluative forms. These instances represent an important need to create space for participants to engage in more broad forms of engagement. In addition, our research uncovers an important risk that exists when social engagement takes on a predominantly affective orientation. This risk could create adverse outcomes if, for instance, dominant voices or practices unintentionally place groups at risk of marginalization in this space, an outcome that could exacerbate education disparities. Nevertheless, we report on methodological approaches and perspectives that support research on metagame environments at scale.

In conclusion, we argue that metagaming environments are spaces where important learning processes take place. The affordances of these environments can be used by educators as well as learning systems designers in order to produce more effective and fulfilling collaborative learning practices.

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