Physical Characteristics and Gender of Avatars in Minecraft Education Edition

Marc C. DeArmond
College of Innovation and Design - Boise State University
marcdearmond@boisestate.edu - 1910 University Dr., Boise, ID, 83725

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Abstract
A visual content analysis of available avatars in Minecraft Education Edition was performed to identify how gender was presented in the limited and pixelated graphical form of Minecraft. Data analysis was performed to determine which physical characteristics were most common among genders. Implications are discussed.

Physical Characteristics and Gender of Avatars in Minecraft Education Edition

The primary reason given for the over abundance of male avatars in games has been the perception that gaming is a male dominated activity with designers claiming market forces are to blame (Tran, 2013; Vermeulen et al., 2017). However, it is possible that this imbalance may persist in educational games where such market forces are not present. Previous research examining traits of avatars such as gender have focused on commercial games not educational games (Fron et al., 2007; Tran, 2013; Vermeulen et al., 2017). This study focuses on the physical characteristics and genders of avatars available in Minecraft Education Edition (MEE), an educational version of a popular mass market game designed to be utilized in educational settings.

The popular game Minecraft, currently a distinct product offering from MEE, originally launched in late 2011 by Mojang Studios to great success. At this point only a single avatar named “Steve” was available for use. As the game grew in popularity, people began to create alternate appearances for their characters that could be downloaded from the internet. In response the company began to offer purchasable bundles of avatars called skin packs. In 2015, a new official default character named “Alex” was added citing the need to match the growing diversity of players of the game (Mcwertor, 2015). Alex was specifically described by Mojang as having thinner arms, redder hair, and a ponytail as well as looking a bit like lead Minecraft developer Jens Bergensen. Players also noticed that Alex had pinker lips and pale skin. While Minecraft creator Notch described the game as genderless and refuted the idea that Alex represented a female human instead of a just a human (Rundle, 2015), Alex was immediately heralded as the default feminine option (Harwell, 2015).

MEE is widely used in schools with over 35 million users in 113 countries (Snider, 2020). As of version 1.17.30 MEE offers 116 unique default avatars (called skins) for players to choose from. Like its predecessor it uses highly pixelated forms to accentuate certain physical characteristics from which each avatar brings with it a natural assumed gender. Examining how assumed gender is represented through avatar traits is necessary to understand the accepted representations of gender in MME and may be transferable to other educational games.
Prevalence of certain physical characteristics and gendered options may limit students’ ability to connect with their avatar during in-school play as well as reinforcing certain stereotyped expectations of gender (Cohen, 2001).

The purpose of this content analysis is to examine the gender availability of avatars and how avatar gender predicts the presence of physical characteristics of avatars in an educational version of a mass-market game. Each of the 116 avatars available in the game were examined and coded according to their physical characteristics displayed in the game. The independent variable will be defined as each avatar’s assumed gender as determined by the coders. Each avatar will be coded based on the following characteristics as dependent variables: arm width, nose width, hair length, mouth color, eye color, eye shape, brow shape, facial hair, and presence of eyebrows. Results will be compared to identify if there is an imbalance of gender options in avatars and to identify which physical characteristics are more common among each gender.

Research Question

RQ1- Which genders are more or less represented in MEE avatars and is this result statistically significant?

RQ2- Which physical characteristics are associated with assumed genders in MEE avatars?

Research Hypothesis

H₁- There are significantly more male avatars than female avatars.

H₀- Assumed genders are represented equally across avatars.

H₂- The prevalence of physical characteristics are moderated by the assumed gender of the avatar.

H₀- There is no difference in prevalence of physical characteristics between avatars of different assumed genders.

Literature Review

One of the major connection points between a user and a game is self-identification through the avatar they choose (Cohen, 2001). Users predominately select avatars that reflect their own traits with some minor alterations (Dunn & Guadagno, 2019). There is a positive impact reported by users when they are able to choose an avatar that reflects themselves in meaningful ways (Dong et al., 2013; Morgan et al., 2020). Research has shown no significant differences in how genders approach selecting or creating avatars (Young, 2018) other than predominantly selecting or creating avatars that match their gender (Guadagno et al., 2011). The field of game design is heavily populated with white males making it common for this group to be overrepresented in avatar selection in commercial games (Fron et al., 2007). Having limited options for avatars is problematic as it can make it more difficult for a player to identify with their character (Dunn & Guadagno, 2019; Morgan et al., 2020). Additionally, the brunt of hostility in online games tends to come from male players against female and LGTBQ players reinforcing the belief that gaming should be a male dominated space (Ballard & Welch, 2015). The overrepresentation of white male avatars is often claimed as being due to market forces as the majority of gamers are thought to be white males (Tran, 2013; Vermeulen et al., 2017), however market reports show a far more balanced interest in video games in general (Newzoo, 2019). Minecraft has been extensively studied for its uses in educational settings (Nebel, 2016; Baek et al., 2020). It is a favored tool for education for simulated 3D environments. As an exclusively educational software, MEE is intended for classroom use. In this environment it can be assumed that no such market forces exist, as educational classrooms
are approximately equally balanced according to gender as opposed to any disparity that may or may not exist in the public marketplace.

**Method**

A quantitative visual content analysis of specific elements of the 116 avatars was performed with regards to how gender is represented. Visual content analysis is used to examine relative frequencies of visual representations taken from images through classification quantification of content (Bell, 2001). The primary researcher performed three rounds of first cycle coding (Miles et al., 2020) to ensure accuracy of coding physical characteristics documenting each avatar’s traits in Google Sheets. During the first cycle descriptive coding traits (Miles et al., 2020) were identified and labeled for each avatar with initial variables of name, assumed gender, arm width, nose width, hair length, eye color, mouth color, and eye shape. During a second pass of the initial coding, labels for each trait were adjusted for consistency and the eyelashes, facial hair, and brow shape were added as additional variables. During the third pass, coding was verified for accuracy and a codebook was created. This strategy allowed for the physical characteristics found in each avatar to be quantified to be compared with their assumed gender as determined by the researchers. Each characteristic was coded as described below.

**Assumed Gender**

Assumed gender is commonly described as the gender that others assume an individual to be based on apparent gender markers such as physical characteristics, voice, clothes, and hair (Portland, n.d.). Research has shown that there is little difference in the impact of a players gender on their need to identify with their avatar (Dong et al., 2013) and that the gender of avatars is important for empathizing with one’s avatar (Morgan et al., 2020). Because MEE lacks any determination of gender within gameplay, assumed gender will be referred to as gender of the avatar and will be assessed by coders as either male, female, or indeterminate using visual cues for each avatar.

**Arm and Nose Width**

Due to the pixelated nature of MEE’s avatars it is easy to determine the specific width of specific parts of the avatar model. Each avatar’s arms are either four pixels wide, like Steve, or three pixels wide, like Alex. The majority of avatars have only two pixels between their eyes but there are a small number of avatars with a wider nose space between the eyes. Arm and nose width are dichotomous interval variables.

**Hair Length**

Hair length is difficult to quantify on a number of models due to hats, hoods, or other head covering. Hair length was generally determined to be easiest to quantify into three groups with short hair presenting visible skin below the hairline on the back and sides of the head, medium length hair showing no visible skin below the hairline on the back and sides of the head, and long hair showing visible hair on the body section of the avatar.

**Eye and Lip Color**

Due to the massive variability of color options available among both lips and eyes in MEE basic color categories were established for coding eye and lip color. A number of avatars lacked specifically colored lips or visible eyes due to eyewear, hoods, or hair. Eye and lip color were assessed as nominal variables.

**Eye and Eyebrow Shape**

MEE uses a variety of shapes to represent eyes and eyebrows. Several characters have no visible eyes and most have no visible eyebrows. However, each shape of eye and eyebrow was...
categorized based on the number and position of pixels used to represent them. In some cases eye
 eyebrow shape had to be assumed because the eyebrows were only partially visible due to head
 coverings or hair. Eye and Eyebrow shape were assessed as nominal variables.

**Eyelashes and Facial Hair**

The last variables after round one coding were the presence of eyelashes and facial hair. Eyelashes were usually seen in avatars as a one or two pixel black dot on the outside of the avatar’s eyes. Differences between beards and mustaches were initially noted but combined in the final pass of coding. Both eyelashes and facial hair were coded as either present or absent without regard to the number of pixels used to represent them. As such, they are nominal dichotomous variables.

**Data Analysis**

Chi-square test for goodness of fit was used to test if an expected ratio, 50/50, of male and female avatars based on assumed gender. Chi-square test for goodness of fit is used to see if there is a difference between expected and observed frequencies in a known population (Frankie, 2012). An independent variable t-test was used to determine significant prevalence of interval characteristics (arm width and nose width) based on assumed gender. Chi square tests were used to determine significant prevalence of nominal characteristics based on assumed gender. Independent variable t-tests are used when comparing means of interval data between two groups (Levin & Fox, 2011). Chi square tests are used to compare expected frequencies with observed frequencies in ordinal and nominal data (Levin & Fox, 2011). Independent variable t-tests are preferred due to greater accuracy however they can only be used for interval data (Levin & Fox, 2011) which was not available for some variables. The null hypothesis proposes equivalent means and equivalent frequencies of physical characteristics between genders; therefore, these two tests should be sufficient to retain or reject the null hypothesis.

**Results**

Data were entered in Google Sheets and analyzed using SPSS 27. 65 avatars were assumed to be male, 50 assumed to be female with 1 avatar’s gender being cited as unclear by coders. The avatar with an unclear gender was not included in further analysis. Using a Chi-Square for goodness of fit with assumed equal frequencies of the remaining 115 gendered avatars the results were determined to not be significant ($X^2 = 1.957, p = .16189$), therefore the null hypothesis for H1 is retained. A second additional test using a 51% female and 49% female frequency did not substantially alter the results.

It was determined that male avatars had a wider arms ($\mu=3.9231, \text{sd}=.26854$) and thinner noses ($\mu=2.0923, \text{sd}=.4229$) than female arms ($\mu=3.42, \text{sd}=.49857$) and noses ($\mu=2.2, \text{sd}=.60609$). Independent t-tests showed this difference to be significant for arm width ($t=6.937, p=<.001$) but not for nose width ($t=-1.122, p=.264$).

Chi-square tests showed hair length ($X^2=81.313, \text{df}=6, p=<.001$) and eye shape ($X^2=40.223, \text{df}=12, p=<.001$) significantly moderated by gender with female avatars having longer hair and wider taller eyes, though the most female avatars eye shape was the same as the most common male avatar eye shape. Chi-square tests did not show significant moderation by gender for mouth color ($X^2=25.839, \text{df}=18, p=.103$), eye color ($X^2=32.623, \text{df}=26, p=.173$) or brow shape ($X^2=38.197, \text{df}=36, p=.370$) though the high number of confounding variables for each of these attributes likely decreased the accuracy of results. Additionally, facial hair was only found on male avatars ($X^2=14.562, \text{df}=2, p=<.001$) and eyelashes were almost exclusively
found on female avatars ($X^2=12.849$, df=1, $p<.001$) even though the majority of male avatars lacked facial hair and the majority of female avatars lacked eyelashes. The null hypothesis for H2 is rejected specifically with regards to arm width, hair length, eye shape, eyebrows, and facial hair.

**Discussion**

With regards to RQ1 the majority of available avatar skins in MEE are male, but not so much so that it is deemed to be a statistically different number. However, a lack of statistical significance does not mean that there is no significance in the lower number of female avatars. While it is possible that trends in gaming are moving towards a more equitable gender balance or that the presumed market forces in educational gaming lead to more balanced gender representation, it is also possible that the presence of more male than female avatars is a sign of bias within game the population of developers (Tran, 2013; Vermeulen et al., 2017).

The results for RQ2 indicate that the most common female avatars have thinner arms and longer hair than male avatars which matches with Dunn and Guadagno’s (2012) determination that female players tend to prefer thinner avatars. Significance was found indicating female avatars were more likely to have eyelashes, no facial hair, and larger eyes indicating that these characteristics were generally considered to be more feminine. However, while eyelashes and large sized eyes were common among female avatars, the majority of female avatars had no eyelashes and standard sized eyes. The only characteristics that were both statistically higher frequency and most common on female avatars were thinner arms and longer hair. The common use of these physical characteristics to imply gender is not necessarily problematic but it does continue to place an emphasis on stereotypical aspects of female beauty: thin, long hair, eyelashes, no facial hair, and big eyes. Additionally, the inclusion of only one avatar that did not have an assumed gender coded as either male or female shows a lack of options for trans or non-binary players common in many video games (Morgan et al., 2020).

**Limitations**

Content was analyzed based on current expectations of assumed gender. Gender definitions are fluid over time (Martin, 2004) and traits ascribed to one gender in this research may change in the future. There is also an inherent difficulty in portraying gender with the limited graphical representations available in Minecraft. One could ponder what possible characteristics avatars could be given to portray gender that are not based on stereotypes. It may not be possible to portray assumed gender without exaggerating stereotypical gender traits. Because assumed gender is based on physical characteristics, it is likely that assumed gender is a self-referential characteristic.

The high number of possible determinations while coding eye color, mouth color, and brow shape likely contributed to difficulties in accurate coding as well as smaller group sizes leading to these determinations being less accurate overall. It is possible that with additional skins to examine, significant trends may have been found. While questions of skin color and race of avatars in Minecraft Education Edition is an important topic to consider, it is outside of the bounds of this particular study due to the inherent challenges of picking an assumed race for a highly pixelated avatar based on anything other than skin tone. Future research may wish to consider racial representation as an additional variable to examine.

This analysis was performed on MEE version 1.17.30 by a single researcher. Between when the research was performed and when it was published, Microsoft has released additional
skins including a number of non-binary skins and gender fluid skins in the *Friends!* skin pack. Ideally, multiple coders would have been used to verify coding accuracy (Krippendorff, 2004). As such this research should be considered as an artifact of the time the research was performed in late 2021.
References


Portland, City of (n.d.) *Glossary of LGBTQ+ and gender terms.*
https://www.portlandoregon.gov/article/730061


