Vida Migrante: Empathy and the Migrant Experiences Through Data Visualization

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Abstract: One of the biggest challenges in developing data visualizations used for humanitarian advocacy and policy change, is creating empathy for the experiences of people described in the data. Summarizing their hardship as numbers and charts does not do justice in describing the often-traumatic experiences they face. In many cases the results of these data visualizations often further remove the subjects from their story making it more difficult for viewers of the data visualization to empathize with their cause. Our research sought to change this dynamic through the creation of Vida Migrante, an online interactive game and data visualization illustrating the trade-offs migrants make every day. Rather than creating graphs or charts from the survey data collected by our partners at the World Food Programme, our interactive visualization uses that data to drive the interactive game experience for our audience to help them learn about the migrant experience. In this paper we illustrate how this interactive game/visualization helped to create empathy in its viewers. Drawing from literature on measuring empathic behavior, our research team developed a delivered a user surveys that allowed us to measure the level of empathy the game created in users. The results showed that while most users already had some level of empathy towards migrants, all participants of the study increased their level of empathy as they were able to step into the migrants' shoes and learn new facts and conditions of the migrant experience that they were previously unaware.

1 INTRODUCTION

In the past decades, the popularity of interactive online games not only as an entertainment medium but also as a tool for educating about humanitarian issues (Berger, 2002). The introduction of online games into popular culture has sparked a new way of thinking about entertainment and education as it provides a completely new medium. Interactive games and the concept of "gamification" have been known to be used to teach and increase awareness of a broad range of topics, including humanitarian issues (Papoutsi & Drigas, 2016). However, empathy is an often overlooked focus when using games to retain knowledge, particularly for humanitarian issues. This paper seeks to broaden the studied work of interactive games as a form of sharing knowledge of humanitarian topics. It primarily focuses on making the game's audience more empathetic to the topic it is exploring. In this paper, we explore the role of games

in creating empathy by analyzing empathy before and after playing an existing game on migrant integration and conducting a user study on its effectiveness to generate empathy. In light of this, there are two primary questions this study is trying to answer. (1) Is empathy generated by playing an online interactive game about humanitarian topics, and how much is generated? (2) Do people gain more understanding of migration through playing the game, and how much more understanding? While this study specifically focuses on one particular game, we hope its findings can help guide the creation of other games, ultimately bringing important humanitarian topics to light.

1.1 Background

The primary focus of this study is an **online simulation game** called *Vida Migrante,* created to teach people about the experiences of Venezuelan migrants living in Ecuador and allow them to

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empathize with the subject (covered in Section 1.2.1). Thus, to properly contextualize this work, some background must be covered, including the importance of empathy in technology, definitions of empathy and interactive games, and a description of the game itself.

1.1.1 The Importance of Empathy in Technology

Traditionary technology is not often specifically deployed to encourage empathy, especially in software products such as games (Anderson et al., 2010; Nishida, 2013). However, because of the incredible growth technology and software have experienced in recent decades, the importance of creating empathic experiences has more been important to the development of games and interactive experiences. For example, "empathy-creating" material is quite important for successfully teaching computer science students about accessibility in the software products they may create (El-Glaly et al., 2020).

Additionally, as games have become popular, their role as an empathy-creating medium is also being studied. Games often receive criticism for being "anti-empathy" mediums—violent games are often cited—yet now more than ever, games are being used to shed light on real-world issues, as discussed in Section 2.1 (Manney, 2008). Therefore, it is important to look at how games can be used to develop empathy towards any topic and how *effective* they can be in developing that empathy. Another challenge in empathy generation is that it takes time and consistent effort to generate, which is orthogonal to the goal of modern technology of accelerating information gain. For example, computer scientists and psychologists have cited decreased human attention spans and focus over the last few decades (Mark, 2023). Empathy creation techniques must evolve to match this rapid evolution in learning about new things (Subramanian, 2018).

Those not already empathetic towards certain topics might have difficulty finding a medium that allows them to empathize in the amount of time and attention they are ready to give. Fortunately, the space of games, with their connotation of being "fun," "engaging," and "interactive," may be an excellent way to bring empathy creation into a face-paced digital world. In our discussion in Section 5, we find that, there are in fact several key features of online games that can generate empathy extremely effectively.

Arthur Berger, in *Video Games: A Popular Culture Phenomenon,* cites several characteristics of games, such as being entertainment, having rules, taking place in an environment, whether real or not, and, most relevant for this study, being perceived as "artificial" and not real life (Berger, 2002). From another point of view, James Gee in *Are Video Games Good for Learning?* creates a definition by broadly categorizing them into problem-solving games, where players need to solve a problem or tackle some issue, and "world" games, where players interact with a simulated world (Gee, 2006).

What makes games different from traditional media is the high amount of *player-environment interaction*, which allows players to immerse themselves in the situations they are put into. Not only does this quality of immersion make games fun and engaging, but it can also be used as an empathy generation tool, as explained in Section 1.2. Given this class of empathy games, we hope that by explicitly studying the effectiveness of our own empathy game *Vida Migrante*, others may be inspired to create similar games so that people around the world can empathize with important issues and ultimately help provide a means to alleviate such issues.

1.2 What Is Empathy?

Empathy in the modern world has been studied in psychology since the mid-20th century. Rosalind Dymond defined it as the "imaginative transposing of oneself into the thinking, feeling and acting of another," which today has colloquially become known as "putting oneself in someone else's shoes" (Dymond, 1949). Later authors such as Ezra Stotland critiqued this definition because it focused too much on how "accurately" the empathetic person could predict the other person's thoughts and actions (Stotland, 1969). Stotland proposed that while empathy is the ability of a person to place themselves into the lives of others imaginatively, it can be defined as the "vicarious" emotional response the person feels due to the other person's emotions. This looser definition allows us to explore how users reacting to a game might gain empathy. Within our definition of games in Section 2.1, oftentimes, there is no "other" person that people can react to since the players act as that person and are making the decisions themselves.

We can explore the facets of empathy generation to deepen the analysis of such from games. Leiberg and Anders guide the analysis by studying how empathy is created (Leiberg & Anders, 2006). Their findings can be grouped into three categories: (1) Empathy can be created by reproducing others' mental states, a process often described as Simulation

Theory [16]. For example, if someone shows signs of pain, empathy is created by simulating that pain in our minds. (2) Empathy can be created through prior representations and *familiarity* with situations. Using the same pain example, empathy can be created when seeing someone in pain by remembering a time when we were in pain. (3) Empathy can be developed through *perspective-taking*, the act of combining information from several sources to determine another person's mental state.

1.2.1 Migrant Integration Background and Vida Migrante

Over the last three decades, around seven million Venezuelans have left their home country, with 500,000 immigrating to Ecuador (*International Migrant Stock | Population Division*, n.d.). Many migrants left Venezuela due to the political and economic unrest, and have come to Ecuador in search of better job opportunities, food security, and access to healthcare and education. However, migrants trying to integrate into Ecuadorian society and economy often encounter many challenges, which our partners as the World Food Programme (WFP) wanted to explore. As such, in 2022, 920 Venezuelan households in Ecuador were surveyed to gain information about their current condition and uncover their specific vulnerabilities (Lab, 2023b).

Findings from a survey showed a disparity between the vocational skills the Venezuelan migrants already had and attainable careers in Ecuador and insufficient resources for migrants to improve their employment opportunities. These factors have led to high food insecurity amongst migrants, to the point that migrants have been reported putting 90% of their income towards necessities like food, rent, and health, preventing them from being able to pursue personal growth opportunities such as training to improve their economic situation (Lab, 2023a).

As our research team began to develop visualizations to illustrate these, among other findings, we quickly realized that it was hard to convey the numerous trade-off migrants make every day. Therefore, our team turned to the idea of creating a simulation game. Our game, *Vida Migrante,* is at its core a data visualization project as real data is being used to drive the outcomes of players of the game. For example, all decisions and cards are based on real migrant data; every decision a user makes has an "implication text" that is driven by real data, giving context to the player's decision.

Vida Migrante: Venezuelan Migrants' Inclusion in Ecuador itself is structured as a single-player,

round-based simulation game where users step into the shoes of a migrant and make decisions for them. As a brief overview, users first select their **migrant profile** and **occupation** (Figure 1), then proceed through a series of 4 months (rounds) where each month they need to decide based on a card they get at random. For example, users may get the "Remittances" card, where they need to decide whether to borrow money to send it back to a relative in Venezuela or forgo sending money altogether (Figure 2). Lastly, users can select assistances provided by nongovernmental organizations which may help their livelihood, which is meant to emulate potential policy interventions (Figure 3a).
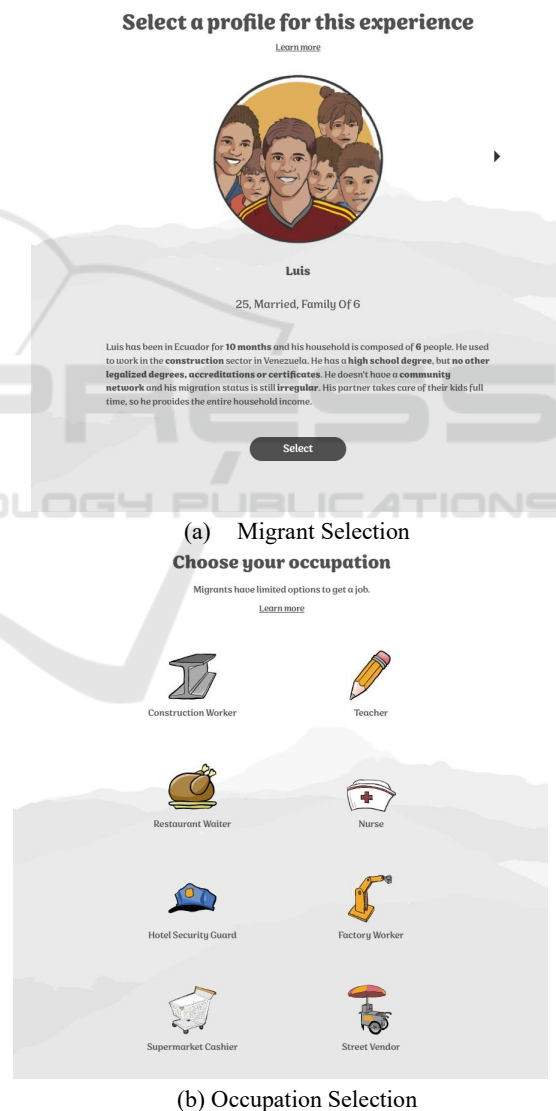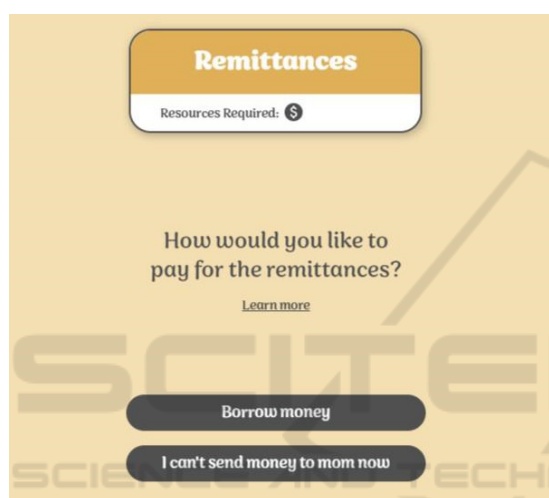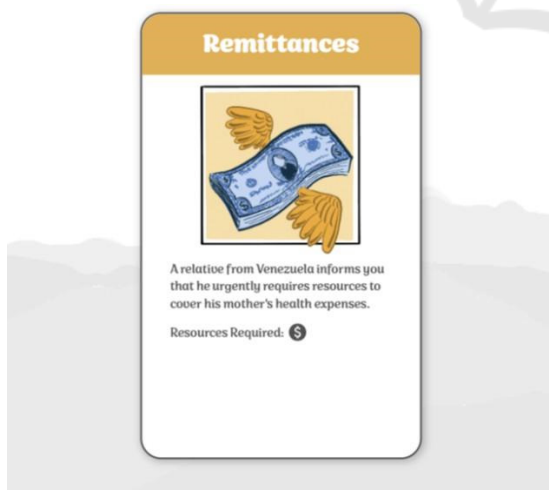

(a)   Migrant Selection

(b) Occupation Selection

Figure 1: Players of Vida Migrante get to choose the migrant they want to experience the simulation as and their occupation.

When borrowing money, for instance, a popup states that "48% of migrants have to ask for money from family or friends to meet their basic needs" (*Vida Migrante - Civic Data Design Lab*, n.d.). Similarly, the migrant profiles—Luis, Génesis, María, and Jose—are not completely imaginary profiles; instead, they are taken directly from the data. The profiles were found by running a K-means clustering algorithm, a form of unsupervised machine learning, on the migrant biographies sourced from the WFP survey data, then by taking the average values of a series of characteristics (such as family size and immigration status) of four clusters (Lab, 2023b). The "average" migrant from these four clusters was transformed into the profiles

(a)   Life Event Card

(b)   Decision

Figure 2: Players of *Vida Migrante* receive cards, such as the "Remittances" card, where they must decide what to do.

we see in the final website so players could empathize with them. The goal of this game is to be interactive and engaging yet also strike a balance between its serious educational aspect and the real issues migrants in Ecuador are facing today.
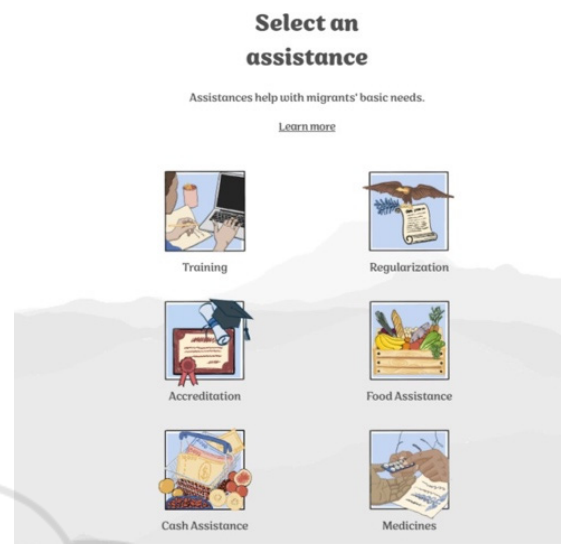

(a)   Assistances Selection Page
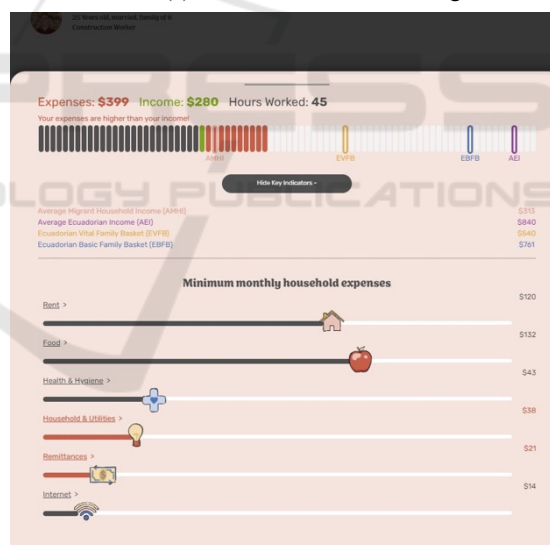
(b)   Dashboard

Figure 3: Players can select assistance twice a game which helps them in their journey to integrate into Ecuador (top). At most points in the game players can also see their current resources in a dashboard view, such as their income, expenses, and hours worked, as well as a breakdown of their expenses (bottom).

2 EMPATHY

2.1 Empathy Games

Past works have surveyed the many games made to educate and bring empathy towards a topic. While this research does not measure the extent to which empathy was achieved, a literature review shows how games designers seek to deploy empathy in their players. Papoutsi and Drigas survey a variety of games, citing the importance of simulations in developing empathy because of their ability to allow users to see an issue "from the inside"(Papoutsi & Drigas, 2016). Along those lines, in *Migrant Trail*, user simulate the experience of migration. Users can either play as border patrol agent or as a migrant themselves, `experiencing what both groups might go through in real life. In an analysis of *Migrant Trail*, Boltz et al. cite the *agency* given to players as the main driving factor for generating various feelings, thus being a good way to create empathy (Council, 2021). This example shows how game designers recognize the power games hold when it comes to teaching empathy, particularly in this topic of migration.

Empathy games are often applied to understand health conditions. One such example of an empathy game is *That Dragon, Cancer*, a game where players play as a father raising a son with cancer, knowing that he only has a few more years to live (*'That Dragon, Cancer,'* n.d.). The interactive game allows players to make an emotional, empathetic connection with the father, experiencing the highs and lows of such a situation. The creator, Ryan Green, even noted that they chose the video game medium because of its ability to "[tell] a story the viewer can be present in" (*'That Dragon, Cancer,'* n.d.). Research on empathy creation from these games focuses on how it helps medical students increase their understanding of patients and their families. For example, Chen et al. looked at how *That Dragon, Cancer* can be used to teach empathy to psychiatry students within a clerkship curriculum, where they were able to find an increase in empathy among students (Chen et al., 2018). Similarly, another study by Ma et al. claims that the game deployment in a virtual reality format increased empathy (Ma et al., n.d.). Ma's study specifically targeted nursing students as well within undergraduate nursing programs.

Another notable example of an empathy game from popular culture is *Papers Please* by Lucas Pope, a game in which players play as an immigration inspector at a fictional border checkpoint, deciding on who to let through and who to deny by checking the documentation of immigrants (*Papers, Please*, n.d.). The game was well received for immersing players into this scenario, establishing empathy for the situations the inspector encounters (Campbell, 2013). This work demonstrates that an empathy game can be created for the topic of migration with success, as shown in the increase of empathy in our study, so the importance of studying the effectiveness of these games cannot be overstated.

2.1.1 Testing for and Quantifying Empathy Creation

How, then, do we test for empathy creation in interactive games? The first tests for quantifying empathy in general began by specifically looking at how well people can share emotions with other people, as described in Dymond's work (Dymond, 1949). These tests asked questions about how people thought *other people* would rate themselves based on a set of several personality traits. In these studies, higher empathy correlated with a more accurate score, whether or not their predictions matched how others perceived themselves.

To address this definition of empathy and the techniques used to quantify empathy were broadened. Much previous work that inspires this study uses *Likert-scale* or Likert-style questions (e.g., "Strongly disagree" to "Strongly agree"), the most notable being Mehrabian and Epstein's Empathy Scale devised in 1972 (Mehrabian & Epstein, 1972). For example, Ma et al. describe how they used *That Dragon, Cancer* to teach empathy to 69 nursing students, measuring empathy with a series of Likert questions (Ma et al., n.d.). Chen's study on *That Dragon, Cancer* explicitly cite using the Jefferson Scales of Physician Empathy to quantify empathy, which also uses 7-point Likert-style questions (Hojat et al., n.d.). This scale, used in health professions education and patient care, is inaccessible in our context, so we needed to create our scale for human migration. Kletenik and Adler describe a game they used to encourage empathy towards accessibility in computer technology, specifically colorblindness (Kletenik & Adler, 2022). This study seeks to replicate and expand on a similar line of work with *Vida Migrante* to see if games can create empathy toward this topic.

3 METHODOLOGY

Due to empathy's qualitative nature, the research deployed a methodology drawing on this previous

research involving a user study that asked several questions related to empathy before users played the game and then asked the same questions afterward.

3.1 User Study Design

The user study had four sections. First, subjects answered demographic questions about their prior knowledge of the topics (Section 3.1.1). Second, they answered "Cognition Questions" using Likert-style scales to assess their initial empathy and understanding of human migration topics (Section 3.1.2). Third, they played through the game and vocalized their thoughts and decision-making to the researcher (Section Section 3.1.2). Lastly, they answered the exact Cognition Questions, which we compared to their original responses (Section Section 3.1.2). The last section had questions about the game and their feelings, allowing them to answer open-ended questions about their experiences.

3.1.1 Demographic and Prior Knowledge Questions

The user study first asked demographic and general prior knowledge questions to get context for each participant. The demographic questions include race, gender, ethnicity, and education level. The familiarity questions asked how familiar participants are with migration and interactive games, even asking questions such as if they know a migrant and how many hours of video games they play a week. Respondents were allowed *not* to respond to any of the questions for privacy and comfort. However, in the final discussion, these responses affect how users interact with the game and their empathy towards the topic.

3.1.2 Game Playthrough and Questions

The survey has eleven qualitative questions that allow respondents to answer on a 7-point Likert-style scale from "Strongly Disagree" to "Strongly Agree" for each question (Cognition Questions in Table 3.1). Each cognition question aims to answer either the empathy research question or the understanding of the issue research question (Section 1), and some questions try to answer both. Despite the qualitative nature of the questions, the response is quantitative because the score is a numeric value from 1 (Strongly Disagree) to 7 (Strongly Agree). We added up all the scores for the 11 questions to determine a final "Empathy Score" (E).

The third section is where participants explored and played through the online simulation game *Vida*

Migrante. This section was the focus of the study, as not only could users learn about and empathize with human migration, but we could also get a glimpse into *how* users approached the material. During this section, we asked subjects to explain their thought processes throughout the game. Participants could comment on the material they were exploring, any issues they saw with the game, and most importantly, their thought process as they made decisions that actual migrants may need to make. As seen in the discussion section, these comments by participants reveal particularly insightful findings on how users gain empathy and understanding as they go through the game. Because it is important to hear these participant comments, this study section was conducted as a one-on-one meeting in an in-person setting.

The fourth section asked the same cognition questions to compare participants' feelings before and after the playthrough. For instance, once the empathy score had been calculated before the playthrough (E_{before}) and after the playthrough (E_{after}), we could calculate the change in empathy and understanding, giving us our final quantitative results. Note that these values' *percent change* ($\Delta E / E_{before}$) is used in the final results for a more meaningful measure.

The survey asked additional follow-up questions on the users' experience with the game listed (Table 3.2). These questions provided us with rich, open-ended feedback that we could use to determine how successful the game was in generating empathy and understanding toward human migration. As discussed in the results section, open-ended question 1 was particularly useful for gauging changes in understanding (Section 4.2), while question 2 was crucial to seeing changes in empathy (Section 4.1). A total of fifty-two respondents were surveyed and played the online simulation game. At a high level, all respondents were college-aged students (ages 18-29) at the Massachusetts Institute of Technology. This may introduce some biases, but the study results provide great insights.

4 RESULTS

The data from our survey reveals that our game did increase empathy in the people we surveyed, and this chapter discusses several key takeaways and insights made by respondents, showing how it generates empathy both quantitatively and qualitatively, with insights about how empathy and understanding were generated and the respondent demographics and their

prior familiarity with the subjects. Quotes were taken from the respondents live during gameplay, not from the written survey responses; some may be paraphrased, but their intention is maintained.

4.1 Changes in Empathy

Overall, baseline empathy for the respondents was already high, with general empathy/understanding of the issue at *0.78,* from of a 0 to 1 scale, before playing *Vida Migrante*. (Figure 3)

Breaking this down into the empathy and knowledge of the issue cognition questions, average empathy started at 0.74 while average understanding started at 0.82. Recall from Section 3.1.2 that 1 represents the most empathy, 0.5 represents a neutral stance, and 0 represents the least empathy. Despite these already high empathy scores, there were still increases in empathy and understanding of migration across the board. More exploration into the "understanding" results is done in Section 4.2, along with qualitative evidence showing how knowledge increased. This section focuses on overall empathy/understanding of the issue and empathy on its own, as it is the crux of this research.
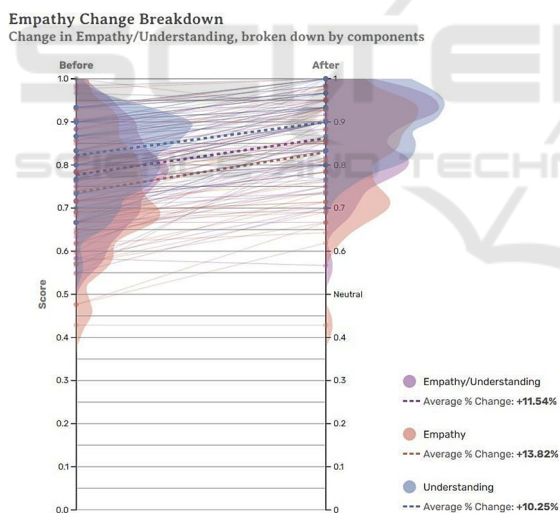

Figure 3: Summary of respondents' empathy scores before and after playing the online simulation game *Vida Migrante*. Scores are broken down into 1) the final combined scores of empathy and understanding (purple), 2) the scores given *just* empathy questions (red), and 3) the scores given *just* understanding questions (blue).

On a quantitative level, overall empathy/ understanding saw a significant increase from *before* playing *Vida Migrante* ($M = 0.78, SD = 0.11$) to *after* playing the game ($M = 0.86, SD = 0.10$), $t(51) = 10.5$, $p < 0.01$.

As referenced throughout the rest of this section, this corresponds to a *11.54%* percent increase. On its own, empathy increased similarly by **13.82%** on average from $M = 0.74, SD = 0.13$ to $M = 0.83, SD = 0.12$ ($t(51) = 9.89, p < 0.01$). As an important side note, this distinction between increases in empathy *alone* (compared to increases in empathy *and* understanding) is calculated by only factoring in questions specifically targeting empathy. To clarify this, we broke down the change in the raw score *per question* (Figure 2). Overall, empathy/understanding factors were found in all 10 questions in the analysis, while empathy alone factors were found in only the questions indicated in the red and purple bars. Looking at the distribution, most respondents showed **increased** empathy after playing the game (Figure 3). Some respondents showed rather stark increases in empathy, showing that even respondents who previously had high empathy still gained additional empathy towards migration.

Additionally, the study shows an interesting trend that appears to arise, where the lower the starting empathy score is, the more significant the percent change in empathy is. However, this may come naturally partly because high-scoring respondents probably won't increase their empathy much because there is not much more to increase by. Unfortunately, while we tried to find survey respondents with a starting empathy score below neutral (0.5) we were unable to recruit them, so our data has some bias in that most respondents already have some level of empathy.

4.1.1 Familiarity with in-Game "Characters"

The first key insight we found during the study was that players connect to the migrant profiles in the game. The primary example of this connection is in the migrant selection process, where respondents often chose to play as the character **they related the most to**. This connection and relatability support the "familiarity" facet of empathy generation, where the more familiar they were with the characters and their situations the more likely they were to activate certain parts of memory that established an emotional connection.

One of the leading examples of this during the study we found is that many young women chose to play as Génesis, the only young, single woman out of the four migrant profiles they could choose from. Statements like "She aligns more with me," "I can make the best decisions for her," "[She is] more relatable", and "[She] feels like the closest one to me"

show that young women may feel the most comfortable playing as someone like them, affording greater relatability and thus creating a stronger emotional connection to them.

While not everyone picked a migrant, they related to the most or were familiar with it. Many respondents simply picked a migrant based on "vibes" or whoever caught their eye without explicitly stating why they chose that migrant. However, we still saw increased empathy among those respondents after playing. This emphasizes the relevance of highlighting features of interactive games to create empathy; one single feature may not establish that strong emotional connection.
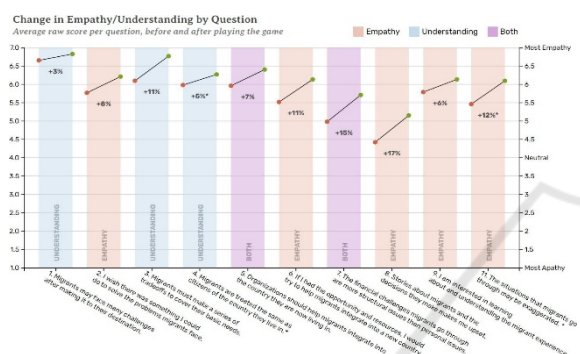

Figure 4: Average raw empathy scores before and after playing the online simulation game *Vida Migrante*, broken down by cognition question. Questions with an asterisk (*) are *negative* and have been normalized, as explained in Section 2.1.2.

4.1.2 Stepping into the Shoes of the Migrants

Many respondents not only cited a strong connection with the migrant profiles, but with the migrant experience itself. This subsection outlines how users "stepped into the shoes" of the migrants as they made the decisions presented to them in the game. These findings demonstrate the "simulation theory" facet of empathy generation described in Section 1.2, where it is clear that players were able to reproduce the thoughts and experiences the migrants would have in real life. What is fascinating about this finding is that there is never a time in the game where migrants are shown making decisions; instead the player makes all those decisions on their own. Despite this, we were still able to find empathy generation that reflected this simulation theory. This may suggest that the interactivity of games can be a potent tool for empathy creation and connection with these experiences, even if they are unfamiliar.

Quantitatively, we look to Cognition Questions 2 and 6 to see how the respondents' empathy increased

after playing the game due to their emotional connection with the migrant experience. Question 2 saw an 11% increase in the average raw empathy score towards "wishing they could help the migrants." Question 6 saw a similar 11% increase the average score where respondents would "try to help migrants integrate into their new country if they had the resources." While not a particularly large change, these increases show that people may be establishing emotional connections with the migrants by playing this game, hoping more and more that they could help their situation. Note also that these increases occurred even among respondents who already had relatively high empathy.

Respondents also provided a lot of qualitative insights into the empathy generated from stepping into the shoes of migrants. One of the most revealing findings was the heavy use of *first person pronouns* (I/my/me) when describing their actions. Some examples from the respondents included statements like "*I* have a lung disease", "*I* have a partner", "Let's help *my* friend", "Cash benefits *me* now", and "*I* need more money". The heavy use of these pronouns as people walked through the game reinforces this idea that people really feel as if they are the migrant making these decisions, which is possible precisely because the game format allows you to do that.Furthermore, some respondents indicated out loud that the simulation game made them feel as if they were experiencing a real situation, or if they were reliving an experience. The vocabulary and phrases respondents used hinted at the strong emotional, empathetic connection with the migrant situation and the decision making they need to do. Despite the game being a simulation, many said phrases indicating that the experiences felt real to them. Some showed that they shared the risk that migrants may take in real life, saying things like "I'm not sure that I can take that risk" and "I'll risk it and borrow money, it'll cost more down the line to treat it". Lastly, given this finding of player engagement, one observation during the study was that many respondents chose to play again as a different character to see what their experience would be like. While unfortunately we were unable to capture a figure for the exact percentage of respondents that did this, the observation similarly shows how people were engaged in the game. Cognition question 9 reinforces this finding, with a 6% increase in sentiment that people wanted to learn more about the migrant experience.

4.1.3 Shared Feelings of Distress and Hopelessness

As we observed during the user study, we indeed found that many respondents had empathy towards such struggles. Not only is this shown in the connection to the migrant profiles and the migrants experiences, but also, as this section explores, the recognition that migrants go through a lot of stress. Given that *Vida Migrante* provides players with a lot of context surrounding their situation, these particular findings support how empathy is generated through the "Perspective Taking" approach, where players infer the mental state of the migrants given the information provided to them, and then *imagine* how they would feel in that situation.

Respondents often verbally exclaimed how the migrant situation and the decisions they had to make were stressful or upsetting. For example, one respondent reacted with "It's kind of sad" when realizing they could not help a relative with remittances because they did not have enough money. Similarly, another noted how "It hurts" when they choose not to help the community because they have no time. Many other respondents cited feelings of hopelessness and being in dire situations, saying things like "There's no way to survive", "Life is so hard", "Either I borrow [money] or I die", and "This is horrible". Most notably, some respondents indicated in the open-ended follow-up questions that they themselves started to feel stressed or hopeless, or at least acknowledged how it might be easy for a migrant to feel that way, showing large amounts of empathy.

We also asked respondents in a follow-up question how *difficult* it was to make the decisions presented to them as migrants. Some respondents mentioned this difficulty in their open-ended responses, saying, "the choices involved are a lot more difficult than I expected" and "migrants have a lot of difficult and unfair decisions." This also contributes to the understanding people gained after playing the game, realizing the decisions migrants have to make when facing tough choices. Six respondents found the decisions not as difficult as expected. However, we believe this may be because some of the scenarios in *Vida Migrante* only allowed users to select a single option, a limitation in the game.

4.1.4 Specific Mentions of Empathy Generation

As final evidence that *Vida Migrante* successfully created empathy, many respondents cited their own increases in empathy and emotional connection to the migrant experience directly from playing the game. On the emotional aspect, many people mentioned how the situations were sad or upsetting. Sympathy can be considered a result of empathy when someone is going through difficult or stressful situations, as is often the case for migrants. Many respondents wrote in the open-ended questions about how the game made them "feel sympathetic to the migrant experience."

There were also mentions of empathy generation, not only because of the content presented but also due to how it was presented in the form of a game. For example, Respondent 4 wrote, "The game made me experience and empathize with the difficulties that migrants face more tangibly," citing specific reasons, such as how the game put them through "emergency situations" that prevented them from making personal progress.

To specifically assess empathy generation, we wanted to see how users would perceive the migrant data, given that *Vida Migrante* visualizes real data from real migrants in a game format. Inspired by William Allen's adaptation of Andy Kirk's typology of data visualization, we asked four questions in a Likert-style format to gauge how much the game helped players 1) *feel* the data, 2) explore the data, 3) *read* the data, and 4) *explain* the data(Allen, 2021; Kirk, 2016). While not entirely clear, results indicated that players were more likely to explore and feel the data than read or explain it (Figure 5). We hope future work can expand on this type of analysis when examining how games can be used to communicate data. Regardless, this notion of "feeling" or emotional connection, which inspired the game's development in the first place, supports the conclusion that the game was successful in creating empathy.
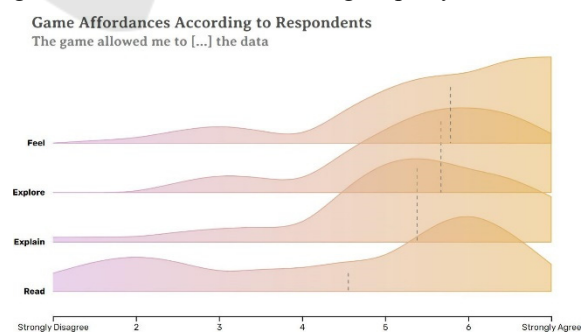

Figure 5: Distribution of responses towards how the affordances the game provided towards interacting with the data, inspired by William Allen's data visualization typology. The mean response for each of the four categories is shown as a gray dashed line.

4.2 Changes in Understanding of Migrant Issues

Similar to the previous section, this section covers quantitative and qualitative evidence on the game's impact, this time diving into the increases in understanding the respondents' issues after playing the game.

Overall, we saw an increase in understanding from before playing the game ($M = 0.82$, $SD = 0.09$) to after playing the game ($M = 0.90$, $SD = 0.07$), $t(51)$ = 6.9, p <0.01. This corresponds with a percent increase of *10.25%.* This increase was smaller than the increase in average empathy alone, possibly due to the factors we noted in the respondent demographics (Section 3.2) and the caveats (Section 3.1). As previously mentioned, initial understanding score was already extremely high at 0.82. This may explain the smaller increase, as there was little room to grow in knowledge of the issue. Nevertheless, we still found a plethora of qualitative evidence from the respondents supporting the conclusion that knowledge of the topic increased, with reactions from respondents such as "migrants have no control over their situation" and the fact that there was still a non-trivial increase in the normalized score is notable.

Additionally, one of the questions we asked as a follow-up after playing the game was whether or not respondents felt like they learned something new. Forty-eight respondents ($\approx$ 92%) said they learned something new. Although learning something new does not necessarily equate to understanding, it does give a glimpse into how respondents were able to make some meaningful takeaways from playing the game. We also asked an open-ended follow-up question on *what* respondents learned (Question 1 in Table 2), which is the source of much of our analysis into the generated understanding. The following subsections dive into four overarching categories in how understanding was achieved, which we derive from responses to this question and the overall sentiment observed from respondents. Note that this section is less substantive than the empathy results because our primary focus was on empathy.

4.2.1 Difficulty of the Migrant Experience

The primary area where respondents showed increased understanding was in seeing how difficult the migrant experience is. Most respondents found the decisions they had to make as migrants rather difficult. However, this section explores the overall difficulty and struggles in the situations conveyed to respondents; respondents began to show signs of understanding that being a migrant trying to integrate into a new country is extraordinarily difficult, not only because of the decisions you must make.

The study drew insights into how respondents gained understanding from one of the open-ended questions we asked, "If you felt like you learned something new, what was it?" Note that the responses we discuss here are related to the difficulty of the migrant experience, though there are many other responses related to themes described in the following subsections. One of the ways respondents recognized the difficulty of migrant experiences came in the form of seeing the large families that migrants had to take care of. One migrant profile in *Vida Migrante,* in particular, Luis, was the head of a family of 6, eliciting shock at how he could care for his family given the conditions they lived.

4.2.2 Illusion of Choice

Another facet of the migrant experience that players gained an understanding of was the *illusion of choice.* Because of limited resources, they often can only make one possible decision. Most notably, respondents noticed that the challenges migrants face are often not their fault but a structural failure of the environment in which they live. This was quantitatively captured by cognition question 7, where there was a 15% increase in understanding that challenges are due to structural issues rather than personal issues, the second highest increase out of all cognition questions. As always, this numeric evidence is supported with quotes and open-ended

Figure 6: Distribution of how *difficult* making decisions was within the game.

responses. For example, respondents noted realizations of how "some of these choices aren't even an option in real life", or "just how many things are out of a migrant's control"/"migrants have no control over their situation" or "much of the time [migrants] don't even have a real decision." There is arguably no better way to understand what migrants go through than to experience it yourself, an experience this game hopes to provide.

4.2.3 Trade-Offs in Decision-Making

The third major insight respondents gained was an understanding of the tradeoffs migrants must make during decision-making. One of the game's goals was to communicate the sacrifices migrants make to survive in Ecuador, and the study found it was successful in doing so. Looking at the quantitative data, cognition question 3 asked whether respondents believed that migrants must make tradeoffs to cover their basic needs, and there was an 11% increase in this sentiment. Although the raw empathy score was already high at 6.09, this question significantly jumped to 6.76.

The study identified three subcategories of tradeoffs that players noticed and understood. First, many noted tradeoffs between long and short-term decisions, which aligned with our goal of depicting the "assistance" from governments and NGOs. Respondents described these choices as "Immediate versus Long-term" or "Short-term needs versus long-term needs." Some, especially those with larger families and high expenses, discussed prioritizing short-term needs. One respondent, frustrated by delaying long-term growth, exclaimed, "Ugh, I keep putting this off," referring to forgoing the training assistance. Second, some respondents recognized the difficult tradeoff between helping others and helping their own families. A common scenario involved community support cards, where players had to choose between helping the community and taking time off work. One respondent initially focused on family, saying they "want the family to be healthy," but later acknowledged that "community is important" when faced with the decision. Another respondent firmly prioritized their family, stating, "I would not" help someone "to the detriment of my own family." Finally, when asked what they learned by playing the game, many respondents explicitly mentioned tradeoffs in decision-making. One respondent mentioned, "Going through the simulation, my involvement in many of the difficult financial decisions taught me more about the trade-offs migrants have to make to put themselves in a better situation." Others mentioned how they learned about "the need to balance between different options" and "the types of tradeoffs migrants have to make daily."

5 CONCLUSION

5.1 Conclusion

This study shows that the empathy game *Vida Migrante* effectively generates empathy and understanding towards human migration in Ecuador. On a quantitative and qualitative level, respondents indicated that they were able to better empathize with the migrant experience and understand the decisions migrants have to go through daily to survive in their new home. Furthermore, this research contributes evidence to the existing literature that games can be an extremely effective tool for empathy generation, even for communicating real data in a highly engaging manner. We also outline a unique method for measuring empathy in data visualization and games, which we hope others can build upon. Interactive games are indispensable for putting players into another's shoes and simulation the experiences that create empathy. Through the process, users learn about other's experiences firsthand and have a greater connection to information. This research helps establish how data visualizations can create empathy, helping to develop a critical literature framing for future developments in the field, especially for how data visualizations can be deployed in the humanitarian sector.

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APPENDIX

Table 1: Cognition Questions (Empathy and Understanding). Questions are answered on a 7-point scale from Strongly Disagree (1) to Strongly Agree (7). If the question is "Positive," the higher the agreement level the more empathy the user has.

Question	Details
If you felt like you learned something new, what was it?	Respondents first answer a yes or no question on whether or not they learned something new, then answer this optional question.
How did this game make you feel about the migrant experience?	Aimed to get a qualitative measure on whether or not empathy and understanding was generated.
Feel free to include any additional notes/follow up questions here	Respondents could leave any comments about the game here, particularly on game quality and suggestions for improvement.

Table 2: Open-Ended Questions.

Question	Positive
Migrants may face many challenges after making it to their destination.	Yes
I wish there was something I could do to solve the problems migrants face.	Yes
Migrants must make a series of tradeoffs to cover their basic needs.	Yes
Migrants are treated the same as citizens of the country they live in.	No
Organizations should help migrants integrate into the country they are now living in.	Yes
If I had the opportunity and resources, I would try to help migrants integrate into a new country.	Yes
The financial challenges migrants go through are more structural issues than personal issues.	Yes
Stories about migrants and the decisions they make makes me upset.	Yes
I am interested in learning about and understanding the migrant experience.	Yes
It is hard to see how migrants could face difficult experiences.	No
The situations that migrants go through may be exaggerated.	No