Enhancing Cognitive Empathy

Interactive Virtual Reality for Empathic Skills Development in College Undergraduate Students

Madeline Kelly

Department of Graphic and Industrial Design College of Design |
North Carolina State University April 29th, 2021

Submitted in partial fulfillment for the degree of Master of Graphic Design

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Signatory Title Page

Program Statement on the Master of Graphic Design Final Project

This document details a final project, which in design is commonly referred to as a graduate "thesis," at North Carolina State University. The work was defined in a 3-credit course in a fall semester and executed in a 6-credit course in the following spring semester. The Master of Graphic Design is a terminal professional degree with a research orientation, but like the MFA and MDes, it is not a primary research degree. This is a discovery-based investigation. Cash (2018) describes the process of building scientific knowledge as a cycle between theory building and theory testing. The theory building mode includes (1) discovery and description, (2) definition of variables and limitation of domain, and (3) relationship building (pp. 88–89). This investigation is restricted to the theory building mode. The theory testing mode includes (4) prediction, testing, and validation, and (5) extension and refinement (p. 89). While experts may have been consulted, this investigation does not entail any testing with human subjects, and it does not endeavor to prove anything; all assertions are tentative and speculative.
See: Cash, P. J. (2018). Developing theory-driven design research. Design Studies, 56, 84–119.

Acknowledgments

Thank you to my family for supporting my career in design, being my practice presentation audience, and sending much-needed photos of the dogs.

Thank you to my long-distance friends and those in the MGD for comic relief, peer-editing, and reminding me I belong here. Specifically, thank you to Rachel, Jamie, Kelly, Ash, Syashi, and Nigel. I am so lucky to know you.

An enormous thank you to my committee. To Helen Armstrong, for grounding my project. To Denise Gonzales Crisp, for opening it up to a wider range of possibilities, and encouraging me not to play it safe. And to Scott Townsend, for your insight, reassurance, and fostering meaning-making. I am so grateful to learn from you.

Finally, thank you to the University of Notre Dame's Professor Neeta Verma, for encouraging me to apply to graduate school, and for her words that have followed me through my career,

"We design as humans, first. We design with empathy, first".

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Abstract

Cognitive empathy, the recognition of another's emotions, facilitates altruistic behavior and interpersonal connection. However, few initiatives exist to develop empathy skills for persons beyond early childhood, and existing interventions for the young adult population often rely on self-guided and self-motivated skills practice. Empathic skills interventions neglecting the young adult population become even more pronounced on the college campus, where young adults from different socioeconomic and cultural backgrounds aggregate to socialize, learn, and cohabitate, and require empathic skills to sustain prosocial and altruistic behavior. A collaborative, immersive experience aimed at enhancing cognitive empathy skills in first-year college undergraduates may foster altruism and connection in the college campus setting. This study uses a recursive virtual reality experience for cognitive empathy skills practice through perspective-taking exercises to allow for controlled and collaborative empathic skills practice. By developing an interactive VR system to facilitate collaboration, contribution, and altruism, outcomes of studies suggest opportunity for a recursive, adaptable, and interactive VR system.

1

Introduction

1. Introduction

In 2017, a Huffington Post article became an internet sensation due to its headline: “I Don’t Know How to Explain to You That You Should Care About Other People” (Chadwick, 2017). The article resonated with millions of readers and captures the contemporary feelings of disbelief and frustration that for some, empathizing is neither experienced nor practiced. Although suffering is now documented, archived, and accessible in unprecedented means and numbers, empathy and actionable altruistic response seem noticeably absent. Perhaps this is because empathy has been reduced to a buzzword, thrown around on the debate stage and preached to kindergarten classrooms, mostly neglected by academia and scoffed at by researchers. Empathy has been misunderstood to be an innate, unchanging characteristic.

Recent advancements in neuroscience and cognitive psychology, however, disprove contemporary misconceptions of empathy; cognitive empathy isn’t a fixed trait, but rather a skill capable of enhancement (Decety & Jackson, 2004). Investigations have encouraged embedded empathy programming in settings such as hospitals, the workplace, and schools, with encouraging outcomes like improved health and decreased instances of aggressive behavior.

For the college undergraduate population, formalized, structured empathy skills programming remains mostly neglected. For first-year students, especially, who migrate from hometowns and parental care to the sudden, diverse experience of cohabitation on the college campus, there is both a significant opportunity and need for empathy skills enhancement. A mass aggregation of students from diverse backgrounds coupled with the experience of roommates, academic collaboration, and newfound freedoms necessitates a student population with the ability to recognize, understand, and respond altruistically to one another's emotions.

This design investigation facilitates empathy programming for college undergraduate students through the use of storytelling, which is expected to evoke empathy and develop empathic skills.

2

Problem Space

2.1. Problem Statement

College undergraduates in the campus setting are faced with a number of sudden, diverse experiences and opportunities for social growth (Escola, 2018). As an aggregate of students from different socioeconomic and cultural backgrounds, the college campus requires empathic skills to sustain prosocial and altruistic behavior (Fry & Runyan, 2018). Some undergraduates may possess empathy skills before they arrive on campus, but for students without practice or latent knowledge, implementing a formal, structured empathy curriculum is essential for appreciating cultural diversity and creating supportive learning climates (McCallister & Irvine, 2002).

Studies show that embedded empathy programming in the academic curriculum encourages empathy development in students (Partridge & Specht, 2019). In addition to the aforementioned benefits of empathic skills development, formal empathy programming also has the potential to improve interpersonal relationships, communication and conflict resolution skills, and to reduce aggressive behavior (Fry & Runyan, 2018). Empathic skills curricula enrich shared representational networks to better understand people of diverse cultural backgrounds, restructuring neural pathways for improved ability to understand and relate (Gerdes et. al., 2010). As a result of enhancing social

skills and cognitive processes, empathy programming is statistically proven to enhance academic achievement, but benefits of empathic skills development are measurable beyond graduation (Escola, 2018).

Despite a multitude of benefits, formal empathy programming has not been implemented frequently or consistently in academic institutions (Gerdes et al, 2010). One barrier may be the long-standing misconception that empathy is an innate characteristic – a damaging misunderstanding that neglects ample evidence of empathic intervention and subsequent behavioral advancement and misperceives empathy as too obscure to be taught (Escola, 2018).In education, even in fields like social work, where psychological processes are by practice malleable, crucial empathic skills are neglected to be taught; and "empathy" is included in reference textbooks without appropriate explanation (Gerdes et al, 2010). Policy and resource allocation present another significant obstacle to implementing empathy programming, as traditional academia neglects social and emotional skills development, and overburdens educators with the responsibility to cultivate these skills at their own discretion and often without formal training (Escola, 2018).

In the undergraduate setting, empathic skills development programs are implemented even less frequently than at the early childhood or high school levels (Hatcher et al, 1994). While many higher-education institutions offer humanist courses of study, academic achievement is prioritized over social and behavioral advancement, and this phenomenon is frequently exhibited in the science, technology, engineering and math (STEM) fields (Cundell, 2017). But denying college undergraduates empathic skills programming during a sudden introduction into a diverse setting, as well as markedly stressful academic rigor, is an ominous setup for increased maladaptive coping mechanisms, bullying, and biased crime (Escola, 2018). Despite exclusion from preexisting empathy curricula, research indicates that college undergraduates are ideal candidates for empathic skills programming, as advances in cognitive development in early adulthood promote others-oriented behavior and understanding of complex concepts (Hatcher et al, 1994).

Undergraduate students require structured empathy programs to create a supportive group-living and learning environment, understand diverse cultural backgrounds to foster healthy relationships, and maintain prosocial behavior (Schutte & Stillonovic, 2017).

2.2. Justification

The neurobiological processes responsible for cognitive empathy are stimulated most effectively by narrative and simulation experiences (Gallagher, 2012). Narrative and simulation have proven even more effective for empathic skills enhancement when presented in an immersive experiential environment (Blasco, & Moreto, 2012). Immersive experiences that successfully engage participants have the potential to evoke social cognition, self-reflection, and interpersonal emotions like empathy (Schutte, & Stillonovic, 2017). Studies show that immersive experiential technologies used in the treatment of psychological conditions such as anxiety disorders as well as cognitive impairments on the autism spectrum proved successful in easing distress, evoking self-awareness, and improving cognitive and social skills (Schutte & Stillonovic, 2017).

In this design investigation, the designed immersive learning environment utilizes user experience design to communicate content effectively and immerse users for desired learning outcomes and emotional evocation. Research suggests that designers are uniquely prepared to facilitate the creation of immersive learning environments, as learning environment design requires appropriate selection of technologies and features to meet learning goals (Appelman, 2005). Furthermore, empathy programming introduced outside of the traditional classroom may more effectively set up the firsthand conditions that the evocation of empathy requires (Fry & Runyan, 2018), while also appealing to omnipresent technology in participants' daily lives (Appelman, 2005). Therefore, this investigation will create the conditions and immersive environment necessary for cognitive empathic skills development in the undergraduate freshmen population.

2.3. Annotated Bibliography

Cognitive Empathy. The basis for this investigation is cognitive empathy, an intellectual process with the capacity to be augmented (Decety, & Jackson, 2004). Although contemporary psychological research has identified three distinct facets of empathy, affective empathy is understood to be a latent characteristic, while behavioral empathy is the actionable result of internal empathic processes (Gallagher, 2012). This investigation focuses on cognitive empathy, because like other intellectual processes, cognitive empathy is a developable skill (Baxter, 1995). Individuals with well-developed empathy skills experience increased job satisfaction, academic achievement, appreciation of diverse cultures, and prosocial behavior, among numerous other benefits (Fry & Runyan, 2018).

Narrative & Simulation. As previously defined, cognitive empathy is a developable skill, the bases of which are both intellectual and neurological processes. The neurological processes attributed to cognitive empathy are activated by narrative and simulation experiences (Keen, 2013). Narrative and simulation offer participants the opportunity to recognize shared experiences, which aid in relating to and understanding distinct experiences (Partridge & Specht, 2019). Narrative is the presentation of an experience, often delivered through storytelling. Simulation refers to the neurological processes by which we understand and relate to a narrative. Narrative and simulation function together to present participants with characters and experiences containing similarities, and experiences to evoke emotion and feelings of empathy (Serino et al, 2009). Narrative and simulation are understood to be the means by which cognitive empathy is developed.

Empathy Programming. While narrative & simulation are strategies of empathic skills development, formalized, structured empathy programming is the formal means of empathic skills practice, and significantly informs this investigation. In early education settings, empathy programming is often introduced within social skills modules, and includes varied activities for emotional identification and reflection, with the goal of encouraging prosocial behavior (Appelman, 1994). Educators in inclusive classrooms apply empathy curricula to encourage appreciation of cultural diversity and understand the experiences and learning needs of diverse students (Hatcher et al, 1994). Medical professionals and medical schools implement empathic skills programming to improve doctor-patient communication, and improved patient compliance, patient outcomes, and healthcare professional job satisfaction have been reported as a result (Blasco & Moreto, 2012).

Undergraduates. Although empathic skills programming has not been widely or consistently implemented at the university level, undergraduate students are ideal candidates for empathic skills programming. Like other developmental milestones, young adults in their undergraduate career have reached the cognitive, social, and emotional development milestones that allow for emotional recognition and understanding in addition to others-oriented cognition and behavior (Escola, 2018). Young adults have the capacity to process and reflect on complex concepts like empathy and altruism, and to apply learned skills to behavior (Schutte & Stillonovic., 2017). Further, diverse campus & classroom settings require empathic skills for maintaining prosocial behavior and an inclusive environment(McAllister & Irvine, 2002). Young adults have become a recent target population for empathic skills intervention, and some professional

fields like medical schools recognize the necessity of empathic young professionals (Cundell, 2017).

Immersive experiences. Beyond structured curricula in the classroom, immersive experiences have also proven effective in mediating empathic skills programming. Research suggests that immersive environments that create a believable sense of presence for participants are able to enhance both content retention and emotional evocation of presented materials (Diemer, 2015). Additionally, applications like augmented or virtual reality experiences report improved efficacy for skills development strategies like accessibility, group reflection, collaborative activities, and perspective-taking exercises (Appelman, R., 2005). In the early childhood setting, believable immersive experiences have successfully conveyed soft skills to reduce aggressive behavior and bullying, along with other soft skills development goals (Cheng et al, 2010).

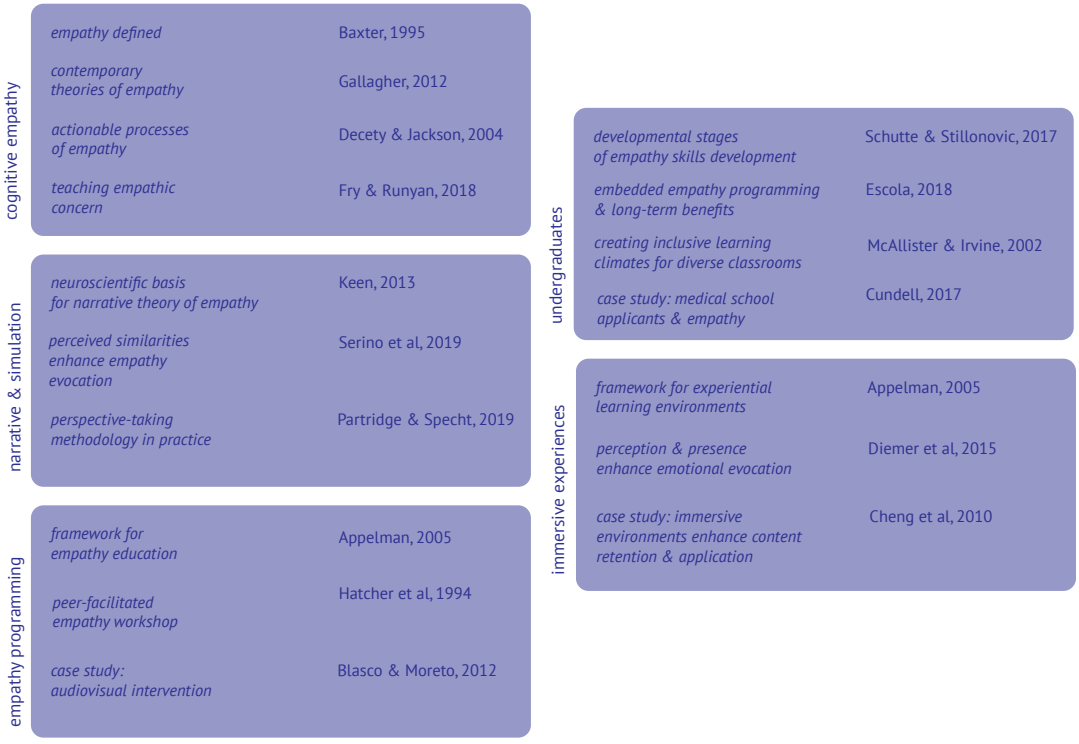


Figure 2.1. *Annotated bibliography*

2.4. Definition of Terms

The following terms are integral to the understanding of the problem scope and subsequent investigation. The terms are defined by the National Library of Medicine.

Affective empathy. The sensations and feelings experienced in response to others' emotions.

Altruism. Unselfish regard for or devotion to the welfare of others.

Audience Experience. Identifies a momentous change in what it means to be part of an audience for a live arts performance.

Behavioral empathy. The actions taken in response to the internal experience of cognitive and/or affective empathy.

Breaking the 4th wall. Any instance in which this performance convention, having been adopted more generally in the drama, is violated.

Cognitive empathy. The ability to identify and understand other people's emotions, without necessarily experiencing those emotions oneself.

Emotional intelligence. A type of intelligence that involves the ability to process emotional information and use it in reasoning and other cognitive activities.

Empathy. The action of understanding, being aware of, being sensitive to, and vicariously experiencing the feelings, thoughts, and experience of another of either the past or present without having the feelings, thoughts, and experience fully communicated in an objectively explicit manner.

Mind-hopping. The practice of switching point-of-view characters within a single scene. This is not the same as the omniscient point-of-view, which would allow a narrator to know things that none of the characters know.

Mirror neurons. A type of cell in the brains of certain animals (including humans) that responds in the same way to a given action (e.g., grasping an object) whether the animal performs the action itself or sees another animal (not necessarily of the same species) perform the action.

Narrative. A way of presenting or understanding a situation or series of events that reflects and promotes a particular point of view or set of values.

Perspective-taking. Looking at a situation from a viewpoint that is different from one's usual viewpoint. The terms are synonymous.

2.5. Assumptions and Limitations

This investigation makes several necessary assumptions and is constrained by a number of limitations. First, I assume users of the proposed design intervention are motivated to participate in the active enhancement of cognitive empathy

skills. I also acknowledge that emotional intelligence and 'soft' skills are not currently measured by a standard, quantitative analysis, and may present differently among participants. This investigation bases measurable outcomes on existing research, not any form of direct testing. Further, content designed in order to teach empathic skills is based on pre-existing studies (see 4. Studies for sourced content); I cannot assume to understand or present lived experiences of [cultural] discrimination associated with diverse college campuses. I assume participants attend school in-person on the university campus, as research in the remote learning setting is limited. Additionally, I acknowledge existing practical limitations on university procedures and resources, including already overburdened educators. This investigation is limited in scope, and will not attempt to address the aforementioned barriers to implementing the described design intervention, including the expertise necessary to understand education administration and funding necessary for this project's implementation in the university setting. Time constraint limits the investigation's demographic to undergraduate students, and assumes that participants experience on-campus cohabitation and abrupt, impromptu, diverse experiences attributed to the first year of undergraduate study. The investigation is further limited by time constraint, and the designed prototype and conclusions suggest opportunities for further research and development.

2.6. Precedents

To augment this design investigation, I conducted a precedent search to determine existing interventions aimed at enhancing cognitive empathy in young adults, including frameworks, design applications, and research studies. These studies and interventions collectively span four research areas: smartphone applications, immersive experiences, soft skills development modules, and gamified interactions. These examples (Figure 2.2) support perspective-taking and group reflection activities through immersive experiences, empathy-induced altruistic action activities, and problem-solving skills to measurably improve cognitive empathy.

The CULTURES professional development model is a seminar-based instructional course offered to teachers with the objective of improving empathic patient communication (figure 2.2.3). CULTURES multicultural professional development seminar utilizes an ongoing teacher cohort group, application of skills in the classroom, contextualization of theory, and promotion of teacher reflection and dialogue. Cooperative learning, role-playing, small group exercises, simulations, and community immersion trips are implemented for enhanced empathic communication and cultural sensitivity in the classroom.

The Brazilian Society of Family Medicine's Cinematic Teaching Methodology (Figure 2.2.1) utilizes poignant movie clips to foster emotional reflection and response in medical students. The Cinematic Teaching Methodology combines small groups of medical students with an experienced facilitator in their profession, and shows short movie clips evocative of patient and coworker experiences while the facilitator makes commentary aimed at the objective of emotional reflection and empathic response. Post-cinema reflection within the group also occurs.

The SPENT desktop game uses gamified interactions to present the lived experience of low-income communities in Durham, NC (Figure 2.2.14). The game requires users to live on a realistic budget and make financial decisions until they are out of money.

The Cat & The Coup is a documentary puzzle game that provides the narrative of the Prime Minister Mohammed Mossadegh and his later downfall (Figure 2.2.16). The game presents Iranian history and celebrates Iranian art.

The LifeData Mobile App is a mobile application designed to promote daily empathic skills practice on a personal smartphone with perspective-taking and critical thinking practices (Figure2.2.5). The LifeData mobile application prompts users with daily notifications to complete exercises from emotion-identification of a human model, to short answer problem-solving and critical thinking questions based on appropriate altruistic response to the model's emotion. The application asks users to identify situations in their daily lives in which they interact with others experiencing emotional distress, as well as appropriate altruistic responses.

The CPT Coach mobile application provides in-the-moment therapeutic assistance for persons with post-traumatic stress disorder (Figure 2.2.8). The application's accessibility on a personal smartphone allows for situated therapy exercises during moments of emotional distress.

Springer Science+Business Media's virtual reality empathy enhancement study used virtual reality and a United Nations documentary to immerse participants in the documentary experience (Figure 2.2.13). VR participants were compared with a control group viewing the documentary in audiovisual format, and were permitted to use both the VR headset and auditory functions as well as a swivel chair to allow for 360-degree panoramic viewing. The VR documentary was followed by empathy and engagement participant surveys.

Yufang Cheng (2010), designed a virtual learning environment for children diagnosed with Autism-Spectrum Condition to learn empathic skills (Figure 2.2.10). In the virtual environment, the children practiced appropriate altruistic responses with avatars in emotionally distressing situations. The environment engaged children with the situations while providing empathic skills strategies.

In "Immersive Theatre and Audience Experience: Space, Game and Story in the Work of Punchdrunk" (2017), author Rose Biggin, PhD analyzes contemporary immersive and experimental theatre shows for their groundbreaking narrative presentation, audience experience, and audience purpose (Figure 2.2.12). Shows like Broken Ghost Immersives, which puts audiences through a series of relevant games, or The Brouhaha Theater Project, which allows audiences to wander through a public park and 'stumble upon' the theatre scenes, are redefining means of engaging an audience with a narrative and changing audience experience from viewer to player.

Themes and findings from these precedents include:

- Participant understanding of an unfamiliar experience is enhanced when presented in an immersive environment
- Engaging storytelling required participant's willing suspension of disbelief
- Research activities are reportedly enhanced when reflection and discussion occurs in a group setting
- Activities of increasing complexity ease participants into empathic skill enhancement and aid in maintaining motivation for participating in skills practice
- Role-play in the group setting promotes an accessible, low-cost, and immersive experience
- The use of real and realistic human faces in virtual reality and smartphone applications increased participants's ability to identify and appropriately respond to emotion during the application's activities
- Collaborative activity promoted greater individual participant engagement and willingness to participate
- Self-guided empathic skills-building may lead to less accurate behavioral responses to identified emotions in addition to relying on self-motivation to complete exercises
- Audience experience that includes audience purpose enhances engagement and content recall

soft skills development modules

Topic	Movie	Scene and Time Counting	Comments
Vocation for Doctoring	Patch Adams	0:32:26–0:35:1	Why do you want to be a doctor?
	The Bone Collector	1:00:49–1:02:1	You have a gift. Don't throw it away!
	Analyze This	0:19:50–0:22:3	You have a gift. You are good. You have a terrific gift.
	Nurse Betty	1: 35:10–1:36:30 1: 40:30–1:41:25	You don't need that doctor. You don't need any man. You know why? Because you've got yourself.
Keeping Your Idealism in the Face of Difficulties	October Sky	1:17:31–1:20:3	The coal mine is your life, not mine. I'll never get in it again. I want to go into space.
	Tucker: The Man and his Dream	1:43:20–1:44:20	What really matters is the idea, the dream.
	Billy Eliot	0:26:00–0:28:20 0:40:16–0:41:20 0:59:17–1:00:26 1:29:00–1:30:12	Several scenes showing the strength of will of a boy who wants to become a ballet dancer facing opposition in his family.
Reflective Attitude	Instinct	1:09:14–1:11:1	What have you lost? My illusions!!
	The Truman Show	1:24:07–1:29:03	Increase the wind. Truman survives because he is tied to the boat.
	About Schmidt	1:54:00–1:56:20	What difference have I made with my life? None at all.
	The Notebook	1:38:00–1:39:00	What do you want? Not your parents, not me. Just you!?
	American Beauty	2:01:00–2:03:00	I remember every single moment of my insignificant life. Probably you don't know what I am talking about. Don't worry. Some day you will. (When you are dead, like me)
	The Lion King	1:04:00–1:08:5	Simba, you have forgotten me. You forgot who you are so you have forgotten me. You are the true Lion King.
Understanding Suffering and Pain	Shadowlands	1:45:50–1:48:1	The pain you will have then is part of the happiness you have now. That's the deal.
	The Spitfire Grill	01:31:36–01:35:00	How we need to listen to peoples' stories, with kind watchfulness
	Secrets and Lies	2:05:00–2:08:00	We are all in pain. Why we don't share this pain? I live trying to make people happy and those whom I really love are fighting among themselves.

(1) Brazilian Society of Family Medicine; audiovisual + group reflection

FIGURE 2. Mirror Neuron Activity

1. Identify an intense or highly emotional scene from an old movie (preferably one students have not seen), such as *Ordinary People, All the Right Moves, How Green Was My Valley, Gaslight,* or *Evelyn Prentice*. Try to limit the video or DVD clip to scenes with only two to four characters.
2. Divide the class into three groups:
   - First Group: Sit in the front row and watch/listen to the scene.
   - Second Group: Sit behind the first group, watch/listen to the movie while mimicking the character's gesture and body positions. Ask them to pay special attention to how their feelings change as they assume the posture of the character.
   - Third Group: Sit in the back with backs turned to the screen and only listen to the scene.
3. When the scene is over, ask all of the students to write down the feelings they think the characters experienced during the scene, as well as what they think the character's motivations and intentions are.
4. Have the students discuss their assessments of the characters in the context of mirror neurons, mirror neurons with the addition of mimicry, and auditory neurons only.
5. Based on your full knowledge of the characters' motivations, intentions, and the outcome of the movie, evaluate which group's empathy assessment was the most accurate.

Ideally, show three scenes from three different movies and allow the students to rotate through all three versions of the assignment: (1) visual and auditory mirror neurons plus mimicry, (2) visual and auditory mirror neurons, and (3) auditory mirror neurons only.

(2) Sample lesson for empathy instruction using audiovisuals

(3) CULTURES teacher workshop

Goal: To ameliorate the patient's experience of anger to a level where effective communication can occur progressing the consultation

Strategies	Skills	Process task
Allow the patient to recount grievances	Ask open questions	Do not act defensive Avoid interruptions (unless essential for control)
Work toward a shared understanding of the patient's emotion/experience	Ask open questions Clarify Restate	Avoid leading questions Avoid giving premature reassurance Negotiate the emotion's name proportional to intensity
Empathically respond to the emotion/experience	Acknowledge Validate Normalize Praise patient efforts	Apologize if appropriate
Explore attitudes and expectations leading to anger	Ask open questions Restate Clarify Acknowledge	Direct anger constructively
Facilitate coping and connect to social support	Make partnership statements Express a willingness to help	Make referrals If appropriate, explore problem solving options Explore patients' networks Avoid anger-causing isolation

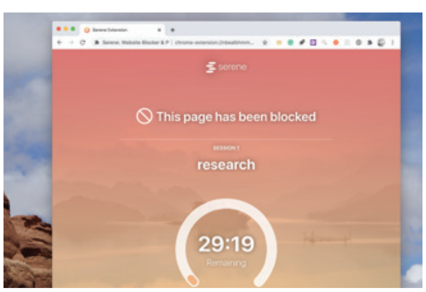
Modular blueprint: Responding to patient anger

(4) CST oncology nurse role-play strategies

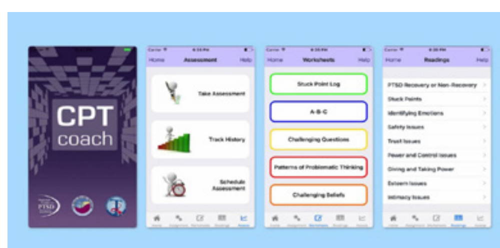
mobile applications

(5) LifeData mobile app for cognitive empathy skills development

(6) "How Would You Feel If?" app for children's social skill development



(7) Serene mobile + desktop app for deep focus sessions



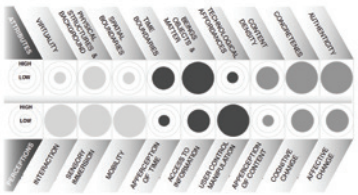
(8) CPT coach app for on-demand PTSD therapy

Figure 2.2.1 - Figure 2.2.17. *Precedents table. Organized by technology. Cont'd on next page.*

immersive experiences

(9) VLE empathy instruction for children with ASC

(10) VICTEC anti-bullying VR (powered by AI)



(11) Appelman's (2005)Framework for immersive environment efficacy

(12) Biggin's (2017).

Table 1 Engagement and empathy items

Engagement
I was absorbed
I blocked out things around me
The time just slipped away
I lost track of the world around me
I was so involved that I lost track of time
During this experience I let myself go
I lost myself in this experience

Empathy
I imagined myself to be in Sidra's (the 12 year-old girl's) situation. (EP)
I felt as if I were in Sidra's shoes. (EP)
I felt touched by Sidra's situation. (EC)
I felt sorry for Sidra. (EC)
I tried to see things from Sidra's point of view. (EP)
I felt compassion for Sidra. (EC)
I tried to take the perspective of Sidra. (EP)
I felt protective towards Sidra. (EC)

(13) Panoramic VR documentary engagement survey

gamified systems

(14) SPENT gamifies low-income experiences

(15) NetEase's Wildfire game tasks users to survive a gainst racism, poverty, & other forms of oppression

(16) The Cat & The Coup celebrates Iranian history & art

(17) Against All Odds, the UN's refugee interactive game to understand the refugee experience

Figure 2.2.1 - Figure 2.2.17. *Precedents table. Organized by technology. Cont'd on next page.*

3

Investigation Plan

3.1 Conceptual Framework

The Framework for this investigation (see Figure 3.1) is based on (a) Gallagher's (2012) Narrative Theory of Empathy and (b) Diemer's (2015) Interoceptive attribution model of presence.

Narrative Theory of Empathy. Gallagher outlines a contemporary framework for empathy development through narrative (2012). The framework describes the means by which cognitive empathy, the recognition and understanding of another individual's emotions, and behavioral empathy, the actionable response that follows from cognitive empathic processes, are enabled through narrative and simulation activities. In the situated context of a narrative, one may be able to recognize similarities between narrative and one's own experiences, subsequently understand the emotions expressed, and behave or respond accordingly. Narratives acquaint one with situations unfamiliar to their own experience, and train the brain to respond appropriately and altruistically.

Interoceptive attribution model of presence. Diemer provides a framework for content retention and emotional evocation through the sense of presence in immersive environments. The framework posits that when participants experience a sense of presence in an immersive environment, both cognitive processes

and emotional evocation are enhanced. Content associated with a sense of presence in an immersive environment includes perception and information, while system factors that may affect judgement of presence and emotional evocation include immersion and interactivity. Essentially, an immersive environment that creates a sense of presence for participants improves retention of presented material and elicitation of emotion.

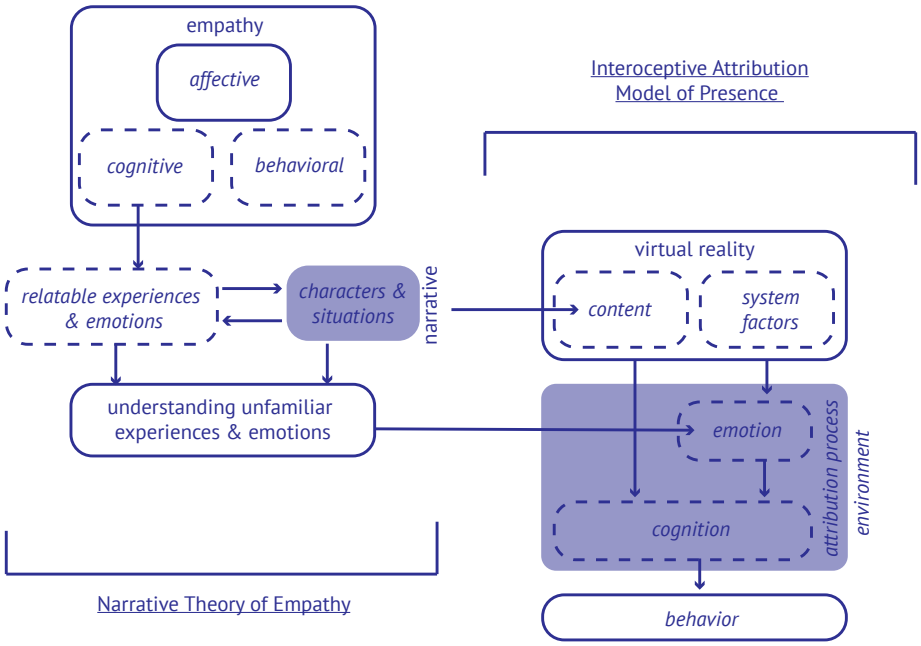


Figure 3.1. *Conceptual Framework.*

3.2. Research Questions

This investigation is driven by the primary research question, and supplemented by the following subquestions. The subquestions provide actionable strategies for study, and are the basis for conclusions drawn.

Primary Research Question (RQ)

How can the design of an interactive virtual reality experience on a university campus incorporate perspective-taking to help first-year students evoke empathy for diverse experiences?

Sub-questions (SQ)

1. How can an interactive immersive experience facilitate engagement with a narrative for students new to empathy training to identify similarities between diverse experiences?

2. How can user interaction encourage collaboration to enable students new to empathy training to recognize and understand emotions presented?

3. How can gamified interactions facilitate role-playing scenarios for students to respond altruistically to presented experiences?

4. How can an interactive virtual reality experience on a university campus build on itself over time to create a recursive learning experience for empathic skills practice?

3.3. Investigation Model

I constructed this Investigation Model (Figure 3.2) in combination with my Conceptual Framework (Figure 3.1) to guide my project research. The Investigation Model follows the principles of cognitive empathic skills in conjunction with the actionable activation and practice of these skills through essential Perspective-Taking exercises. Centering the investigation on three cognitive empathy skills (identifying similarities, recognizing and understanding emotions, and applying understanding to altruistic behavior), as well as three perspective-taking exercises (engagement with a narrative, participant collaboration, and role-playing scenarios), allows for controlled investigation into specific moments of design intervention. The fourth and final subquestion addresses the experience over time, and attempts to build new experiences into a recursive experience.

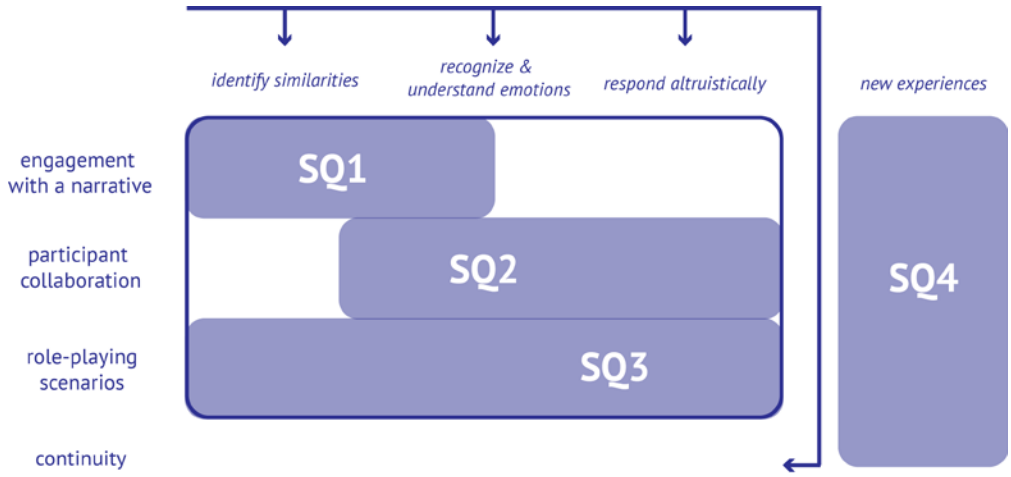


Figure 3.2. *Investigation Model.*

3.4. Scenario

Peter Bennett (persona) is a first-semester freshman at North Carolina State University. Peter was homeschooled with his brothers by their mother in rural North Carolina, and his family is affluent. Peter interacted with other children through the community football team. During these community practices and games, Peter was often benched for aggressive behavior on the field. As a result of his aggression in his only significant group opportunity, Peter does not have many friends. Peter is nervous about attending college away from home and potentially being unable to make friends on campus as a result of his behavior.

North Carolina State University has assigned a time slot during freshman orientation for every new, first year student to use an interactive empathy virtual reality experience. The students are assigned another time slot to use the interactive empathy VR experience during mid-semester.

The following scenario (Figure 3.3) depicts Peter's first and mid-semester experiences with the interactive empathy virtual reality experience.

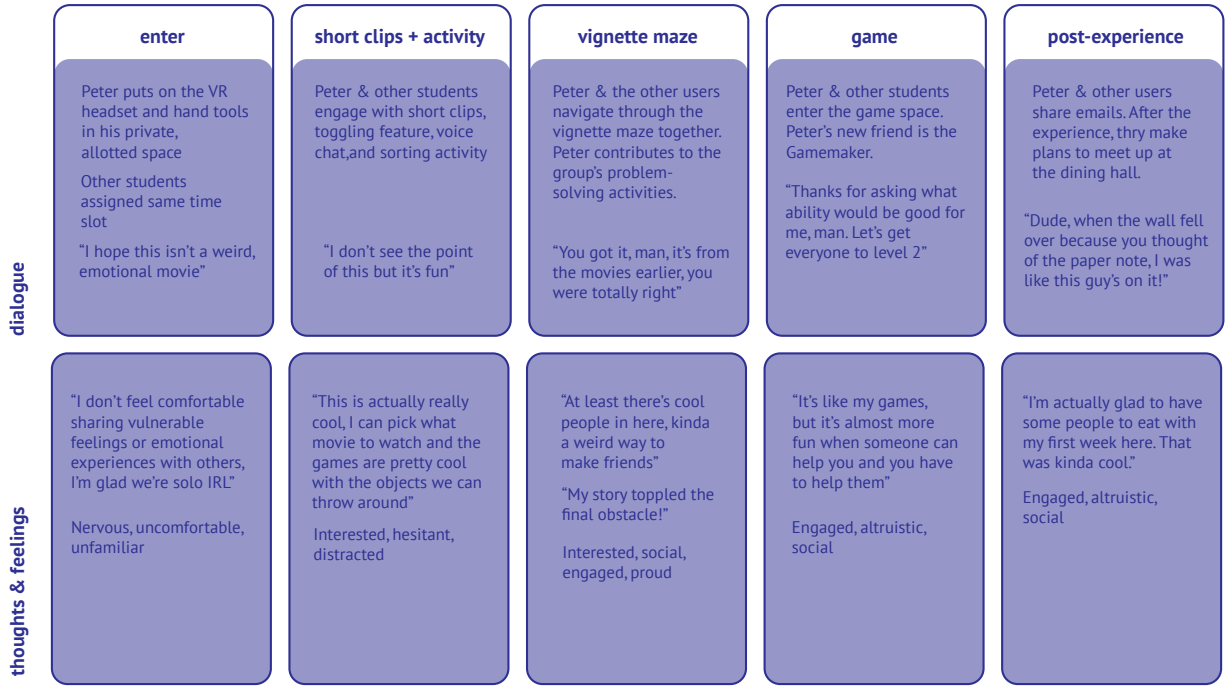


Figure 3.3. *Scenario.*

4

Studies

4.1. Engagement with a Narrative

To investigate how an immersive experience might facilitate engagement with a narrative, I developed a series of exploratory studies visualizing narrative presentation in the virtual reality space. These studies are based on: (a) principles of immersive theatre and audience experience (Biggin, 2017), and (b) analysis of the failures of soft skills development modules (Dobbin & Kalev, 2018). Biggin's principles of immersive theatre and audience experience (AX) support audience experiences in the virtual reality space beyond the detached interactions of film or traditional performance. Dobbin & Kalev's investigation into the failure of skills application from soft skills development modules informed narrative content and user interaction during Study 1.

I developed a series of studies to visually explore how storytelling content might be designed and presented in the virtual reality space. Approaches to designing narrative presentation were refined to include engagement with a presented narrative beyond a film or short clip. User agency, interaction, and purpose also contribute to engagement with narrative content in this study.

In addition to narrative presentation and audience experience, I also visually explored user representation, tangible relics of conversation, and materiality

in the virtual reality space. The application of principles from immersive and experimental theatre were also explored, although not included in final storyboards (Figures 4.1, 4.2). These precedents inform studies moving forward in this design investigation.

User Representation

User representation in the virtual reality space required that I consider the study's population and its content. Protecting vulnerable identities when role-playing sensitive scenarios or viewing narratives with similar content necessitated user avatars that removed identifiers. The robotic avatars and anonymity also allow for users to step out of the interactions and thoughts defined by unique and sometimes constraining identities (Figures 4.3, 4.4).

It should be noted that in these visual explorations, 'users' are placed in the space and interact according to imagined scenarios. No user testing was performed. Some scenarios refer to a 'main' user, defined here as simply a user in the scenario from which perspective is based on. There exists no participant preference, and 'main' users are simply random, imagined user perspectives. Some visual explorations rely on a mix of these 'plants', performers, and imagined human users. Users will be defined for studies.

Film Narrative

The first event in the virtual reality space is based on the Brazilian Society of Family Medicine's (2017) Cinematic Teaching Methodology. The first event, designed to present a narrative via audiovisual, places participants in the virtual reality space in small groups to view short clips (Figure 4.5). The three short clips (Universal Pictures, Summit Entertainment, Windstruck Productions) present narratives of young adults experiencing alienation. The film characters are of the same age as the participant demographic, and plots are similar between clips, but differentiated to maintain interest. Scenarios depicted in the clips reflect interactions that may take place on the college campus. Short (1-1.5min) clips account for attention spans to encourage engagement, while sliders allow participants to toggle between the short films. Groups may watch any of the three films, including different groups watching the same clip at the same time, separately. The slider and toggle features allow for choice, granting participants the ability to select their viewing experience(s) (Figure 4.6). During viewings, participants may use voice-chat to interact with other participants.

Engagement with a Narrative: Beyond the Films

To simply view a short clip in the VR space may facilitate engagement with a narrative, but would be a detached user experience relegating participants to the role of viewers. As such, visual explorations to follow the film narrative concentrate on encouraging engagement and narrative content recall through user interactions with one another and with(in) the VR space.

Manifestation of Dialogue

After the short clips are viewed, the film screens rise and small groups become visible to one another (Figure 4.7). These short visual studies recall an essential question to this design investigation: Why VR over the physical world? The ability of the virtual reality environment to manifest intangible interactions is an undeniable affordance over the immersive space over physical reality. In these short studies, the VR space makes user dialogue manifest as a tangible object.

Following the rise and disappearance of the film screens, a voice prompt draws connections between separate small group conversations during the clips. These pieces of common dialogue become manifest in the immersive space (Figure 4.8). Not only does this feature connect experiences and interactions between participants groups or even separate films, but also introduces the significance of user conversation. Voice-chat communication can become a feature of the immersive environment.

Content Recall Through Object Sorting

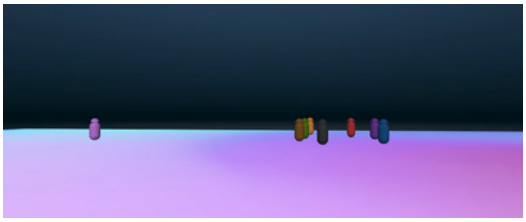
User engagement with the narrative(s) presented in the short film extends to a sorting activity in order to encourage: (1) content recall, (2) varied user interaction, (3) material affordances in the VR space, and (4) conditioning users to interact with objects (especially their own manifest dialogue) for later activity.

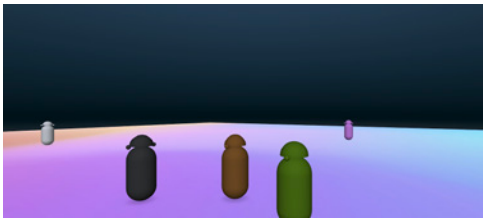
After user dialogue becomes manifest as text objects in the physical space, a voice prompt asks users to identify more similarities and differences between the short films they viewed. Venn diagram-like shapes materialize in the space, responding to the voice prompt (Figure 4.9). Objects from the clips also manifest in the immersive space (Figure 4.10). It's important to recall that users were able to select between the clips they watched, so some small groups may have (or have not) viewed different clips. Therefore, the sorting activity requires participants to not only learn to interact with objects in the space, but also with one another to coordinate movement and ideas (Figure 4.11).

By sorting the objects between clips, users recall the narrative(s) they viewed while interacting with one another. Discerning both how and why to pick up (which) objects is another significant event in this visual exploration, as users learn how to interact with the space and what affordances are available in the VR space.

Observations

The visual explorations in Study 1 emphasized the importance of audience experience and audience purpose in the space. Imagined participants in the VR space exposed to narrative content require more than the bank-teller method of education for content retention and emotional evocation, and immersivity alone cannot fulfill that requirement. Engagement with a presented narrative must occur beyond the film screen, and user interaction to engage with the narrative must occur both between users and between user and space. Lastly, user agency enhances audience experience from viewer to contributor. Providing means of choice, artifacts of conversations that may be intangible or insignificant in another space, and allowing users to participate in means requiring movement and coordination are all empowering and engaging features that suggest content retention, sense of presence, and sense of purpose in the VR space (Figure 4.28).





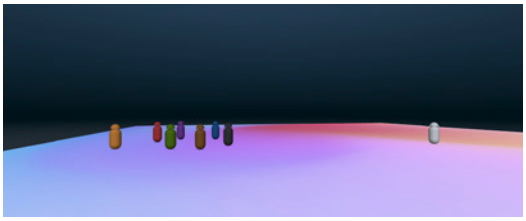


Figure 4.1.1 - Figure 4.1.3. *Mindhopping between user perspectives in the same VR space, based on precedents of immersive and experimental theatre. A user views a scene from different perspectives.*

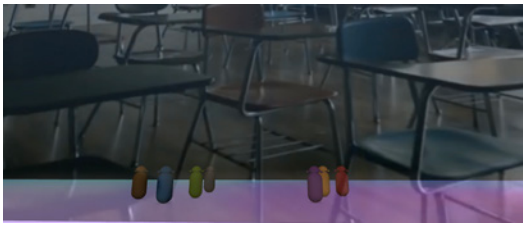


Figure 4.2. *Breaking the 4th wall, based on precedents of immersive and experimental theatre. A user views other users as they participate in watching a short film.*

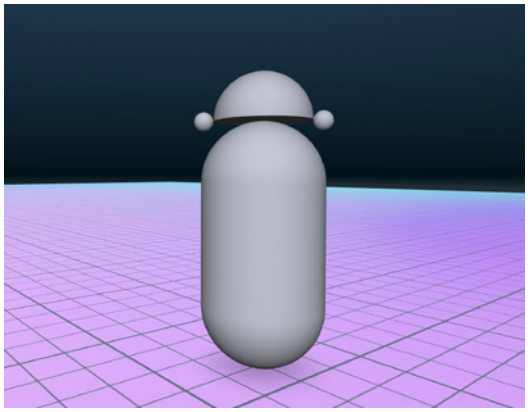


Figure 4.3. *User avatar. Designed in the style of robotics. Protects anonymity.*

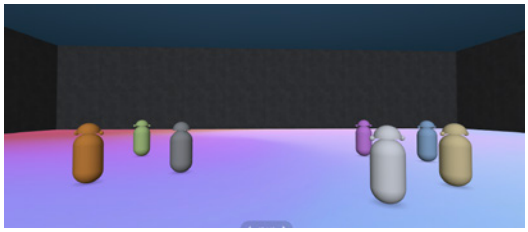


Figure 4.4. *Color differentiation for user differentiation and relationship building during the VR experience.*

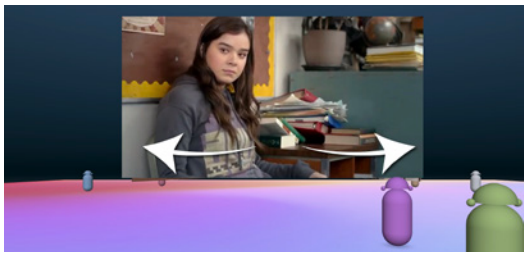


Figure 4.5. *A group of users view one of the short films in the VR space. Arrows shown allow toggling between clips.*

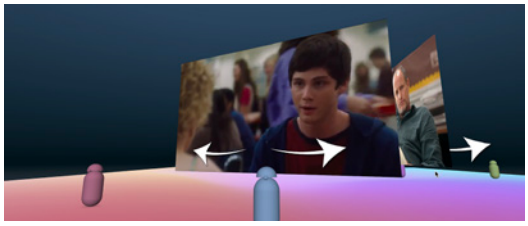


Figure 4.6. *Users watch films in small groups. Also visible: another short clip and small group. Note sliders allow toggling between clips for all groups.*

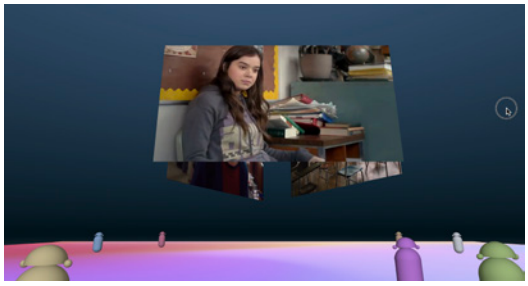


Figure 4.7. *Film screens rise and small groups become visible to one another.*

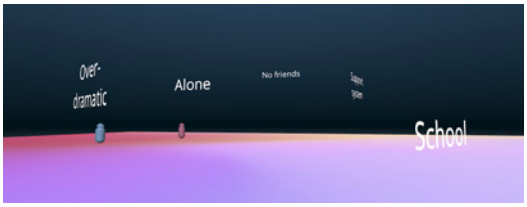


Figure 4.8. *User dialogue manifest as objects in the VR space.*

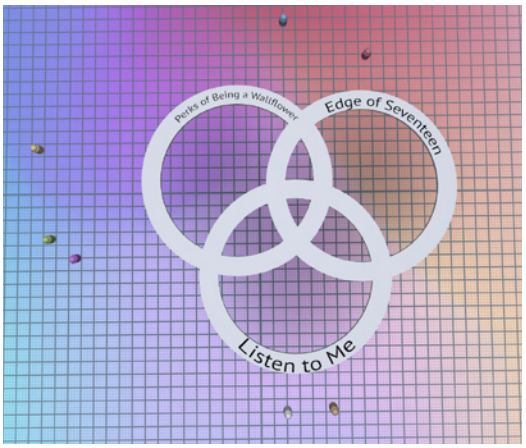


Figure 4.9. *Venn diagram shapes with film titles for sorting similarities and differences between the clips. Voice prompts activity. Seen from above.*

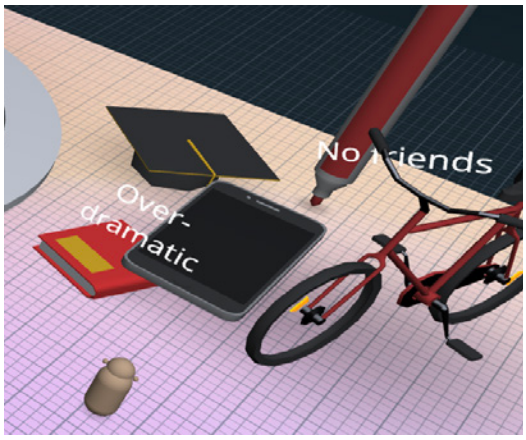


Figure 4.10. *Some of the objects and text for sorting. Note object scale to user.*

Figure 4.11. *Objects sorted into 3D Venn diagram shapes.*

4.2. Participant Collaboration

To explore how user interaction might encourage collaboration and ultimately, emotional reflection, I developed a series of studies visualizing imagined exchanges between participants and (with)in the space (Figure 4.29). The visual explorations were based on aforementioned theories of presence, audience experience, and experimental theatre, as well as precedents of effective emotional reflection and principles of collaborative activity. First, the LifeData mobile app designed by Fry and Runyan (2018) suggests that self-guided reflection and soft skills practice are less accurate than group reflection and team skills development, necessitating collaboration within this design investigation. Second, research into collaborative activities yielded a multi-faceted definition; collaboration consists of reflection, communication, navigation, and/or generation. In this study, those principles of collaboration were applied to post-narrative reflection activities for participants to identify and understand presented emotions.

Reflection

Reflection following Study 1's short clips allows participants to enhance their ability to identify and understand emotions presented in the narrative. Reflective activity in this part of the study concentrates on four key questions: (1) What was the student in the film feeling; (2) What events or actions may have caused the student to feel this way; (3) What nonverbal or body language cues indicated that the student felt that emotion; and (4) What experiences have you had that evoked a similar emotion? These questions, based on The Brazilian Society of Family Medicine's Cinematic Teaching Methodology, aim to contextualize the narrative presented in Study 2 with reflection and application to the participants' experiences.

The first visual explorations focused on how to prompt users into reflecting while taking into account the affordances of the virtual reality space. To simply posit a question strips the audience's purpose in the environment, and reflection therefore must take place as an integrated immersive experience. Reflection occurs in this investigation as part of a collaborative system of generation, navigation, and communication; a means to an end and a goal in itself.

Reflection questions are implemented in design features in order to improve answer accuracy, engagement, and group collaboration. I designed a Likert Scale featuring emotions for correct emotional identification of the narratives presented in the short clips in Study 1. Users could move an obstacle wall by aligning themselves along the correct emotion on the scale.

Another reflection prompt included in the visual explorations is a spinning prompt and type repository (Figure 4.14). This spinning prompt rotates too quickly to be legible, but is slowed by throwing and lodging type objects from the type repository, much like a spoke in a wheel (Figure 4.15). When the prompt slows, it says "nonverbal cues", and the objects from the type repository feature specific nonverbal cues that may have indicated the emotions featured in the short clips from Study 1.

Voice prompts also facilitate action and reflection activity during this study, but aren't the only feature designed to encourage emotional reflection. In the final activity of the vignette maze, a voice prompt asks students to identify experiences from their own lives in which they, too, have felt alienated. The students use voice-chat to recount their stories, and the stories manifest in the space as objects, used to topple the final wall.

Reflection in these visual explorations is achieved via activity. Physical movement, interaction with objects, voice prompts, and physical obstacles facilitate activity designed to evoke reflection, and the identification and understanding of emotions presented in Study 1's narratives.

Communication

Perhaps the first facet of collaboration is participant communication. To facilitate a collaborative experience beyond the chat-room format, the visual studies utilized different forms of communication including voice-chat, and material response.

I began the visual studies by exploring exchanges in the text-chat format. Although text-chat is accessible and grants participants voice anonymity, text-chat communication presents legibility conflicts, especially in the immersive space when viewing other objects or the environment. Text-chat communication is therefore not included in refined visual explorations.

Voice-chat communication was a logical next step, and allowed participants to communicate without reading. Voice-chat communication remained a way to differentiate between interpersonal interactions and those with the space and its materials. Voice-chat also functioned with an imagined natural language processing capability, in which the environment responds to dialogue consistent with reflective content aims (Figure 4.13).

Material responses occur when voice-chat dialogue is recognized as accurate narrative reflection. Physical manifestations of dialogue appear or drop into the space to encourage participant reaction– including physical, conversational, or navigational responses. In one scenario, participants recall a paper airplane from the narrative film, and the paper airplane subsequently drops into the space. Participants react by throwing the paper airplane, and when they do not receive a reaction from the physical space or its objects, discuss a means of altering the object.

Objects may also alter other objects in the immersive environment. In the same paper scenario, the paper airplane scales in size as a reaction to participant conversation consistent with reflection aims (Video, Figure 4.13). The participants, barricaded by a wall, throw the scaled airplane at their blockade, successfully knocking it down and moving to the next activity in the environment.

Navigation

Movement between activities within the space is the applied navigation facet of collaboration in this study. Navigational collaboration served a few purposes: transitioning between activities; emphasizing the sense of space and presence within the immersive environment; exploring material affordances in VR; and motivating participants. As noted in "Reflection", the four-part reflection prompts necesitate distinct activities and activity spaces, and requiring users to collaborate in order to move between reflective activities added a collaborative element to what is already an essential task (Figure 4.12). Users must work together to navigate, rendering collaboration a bi-product of the movement.

Movement between activities also serves the purpose of establishing senses of space and presence in the virtual reality environment; setting up walls to be navigated around for the next task suggests extension of visible space, a scene beyond that which is visible. Participants are grounded by walls, limiting visibility and movement, with the distinct sense of something beyond.

The mutable walls used for navigation also emphasize the VR space's material affordances. The walls in the visual scenarios are pushed aside, knocked down, and tipped over, indicating to users that objects within the space can be manipulated, a useful hint for activities and a uniquely-VR affordance. In one scenario, the wall itself is pushed by participants' group movement in the correct position on a scale against the wall. Here, movement begets movement, and informs users of the physicality and agency of their own avatars. Shifting walls are more than

their movement or a means of navigation, they're subtle coaches and engaging objects.

Coaching is also a significant feature of the participant experience in these visual explorations. Due to the nature and breadth of these reflective and collaborative activities, it is important to facilitate interactions with objects in the space – which objects should users interact with, how, and for what purpose?

Navigation is lastly a tool for engagement and motivation. Navigation functions within the larger collaborative system as a goal– participants accurately respond to the reflective prompts in order to remove their barricade and move to the next scene. Navigation becomes collaborative as a goal: to move to the next activity, and as an essential activity itself: in changing walls, physical movement, and motivation to complete an activity.

Generation

In addition to the base reflection goals of identifying and understanding emotions presented in a narrative, the collaborative principle of generation provides participants the opportunity to further enhance empathic reflection by relating the emotion in the narrative to the same emotion in one's own experience. Generation also allows users to add to the space with their own narratives, contributing storytelling artifacts as agents able to manipulate the VR space (Figure 4.16).

While the generation phase of the collaborative scenario accomplished the final reflective activity prompt (What experiences have you had that evoked a similar emotion?), the capacity to add to the immersive environment also fulfills important facets of audience experience by elevating participants from audience to user. Granting users the ability to contribute their own stories imparts them user agency, tangible contributions to the space, and visible relics of their vulnerability and empathy.

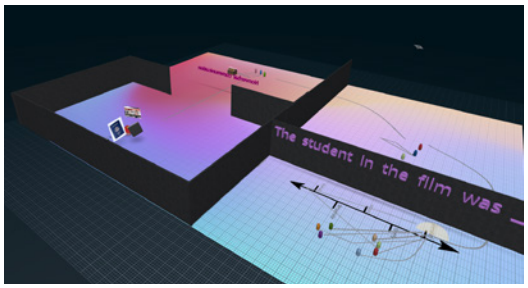


Figure 4.12. *Vignette maze through which reflection (via collaboration) takes place. Seen from above.*

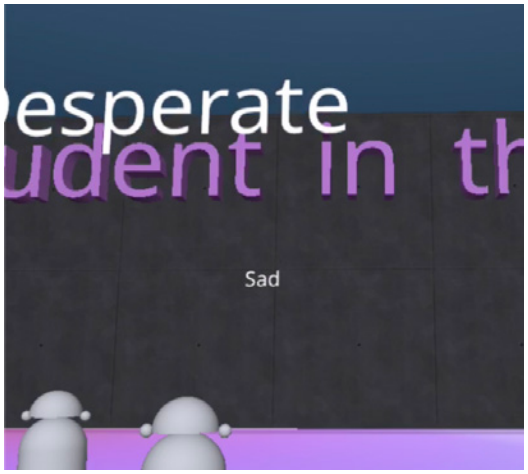


Figure 4.13. *An example of dialogue manifest as objects capable of manipulating objects, in the VR space. Here, users attempt to identify emotions presented in a short film.*

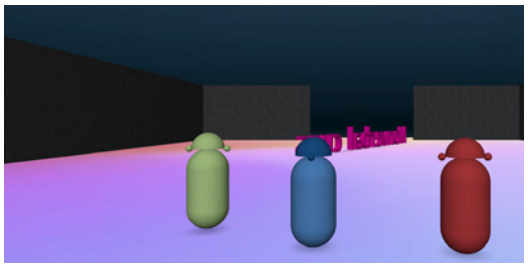


Figure 4.14. *A piece of spinning type blocks a visible exit. Participants discern how to slow the type to enable passage.*

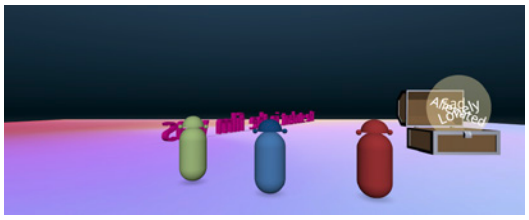


Figure 4.15. *Subtle coaching helps participants discern which objects to interact with, how, and for what purpose(s). Here, a blinking light surrounds a suggested object. Small object movements may also coach users.*

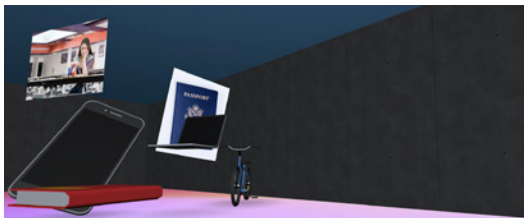


Figure 4.16. *Objects generated in the immersive environment as a response to participant conversation. Participants share experiences related to the objects, and the system rewards users accordingly with the object.*

4.3. Gamified Interactions

To determine how gamification may improve altruistic response during role-playing scenarios, I created a series of imagined game scenarios based on Lumen Learning's "Freshman Experience: Living with Diversity" module role-playing scenarios (Figure 4.17). These sourced scenarios address common experiences of college students (Figure 4.20). The gamified role-playing interactions and the visual explorations that follow in Study 3 are based on four guiding principles: (1) participation, (2) motivation, (3) altruism, and (4) agency.

Participation

The first feature of the game space that I explored is user participation. This study derives from precedents that suggest that participation improves engagement, and further posit that for the young adult population specifically, participation in soft skills development modules relies on external facilitation. To encourage participation, I created a series of interactive features in the VR game space designed to present user participation as both advantageous and tangible. In the game space, users are all shown their own 'User Contribution Banks'. User Contribution Banks feature the objects and physical forms of dialogue that players contributed to the VR space during earlier activities (see: Studies 1 and 2). In the game space, users may drag and drop the items from their User Contribution Banks to aid in navigation through the space in order to advance to the next level (Figure 4.18). Users who have contributed frequently during prior activities will find themselves at an advantage in the game space; these players have User Contribution banks with increased objects for navigation and problem-solving their less participatory players.

For those players that may have been reluctant to participate in earlier activities, user rankings after each level provide another incentive to participate. Users are ranked against one another, adding a competitive feature to the game space (Figure 4.19).

Finally, participation is encouraged by the power of the Gamemaker to assign abilities. As a bi-product of participation in earlier immersive activities, relationship-building may influence the abilities the Gamemaker assigns users. While the designed features encourage user participation by different means (advantage and reward, competition, and favor) the user contribution banks, rankings, and power of the Gamemaker suggest more opportunities for players that have or are actively participating.

Motivation

Designed features to motivate players in the game space are related to, but also distinct from, those designed to encourage user participation. The features designed for participation purposes relate to the immersive experience prior to players even entering the game space. Features designed to motivate players exist within and for the game space, and are based on principles of game design like incentive and objective.

Separate from the content objective to teach altruistic response skills, the game space and motivation to play rely on an objective for players to work towards. In this game, the objective is clear from the signage used to bait players: advance to the next level. This objective is reinforced when players reach the portal to the next level, and are congratulated for advancing on.

The content objective is designed into the rankings feature, reward system, and Gamemaker role. The rankings system, shown at the end of every level, ranks users based on their altruism in the space (Figure 4.19). Sharing objects from a personal user contribution bank, problem-solving via voice-chat, or noticing a player left behind may all earn a user a high ranking. Since users are not shown the information explaining their rankings, motivation to simply be the first to advance to the next level stands, while rankings that do not coincide with speed subtly suggest a competition beyond finishing place.

In addition to the covert rankings, a rewards system may motivate immersive game players. Similar to the function of the rankings, users that have exhibited altruistic behavior are rewarded with additional objects in their user contribution banks. These rewards are not based on navigation speed, use of objects, or other external factors, and as the rewards system refills user contribution banks, reinforcing the use (rather than collection) of objects, especially for use by the group.

Altruism

Gamifying altruistic responses through the use of role-play required subtle role-playing scenarios for aforementioned means of motivating players to participate. Precedents suggest that young adults frequently view soft skills development modules as overdramatized and/or obvious, while ableism in role-playing experiences is also a prevalent problem. Designed features must therefore reflect scenarios in which altruism might be taught, practiced, and rewarded, without reducing lived experiences (Figure 4.22).

The Gamemaker's power to assign abilities to players in the game space achieves content objectives of altruism role-playing by providing opportunities for players to aid one another in navigation and advancement to the next level. Players are not given abilities that are more or less advantageous, but are rather awarded affordances that may be advantageous in the game space. A player with voice-chat capabilities might communicate directly with a player that has a duplicating object affordance, and can send notes back or create longer pathways for navigation.

The Gamemaker's power to select a player's ability is an opportunity to subtly role-play altruism (Figure 4.21). The Gamemaker has constraints on who might have which ability, no one player can hoard all game affordances. In a roundabout way, relationship-building in prior activities may also be a form of altruistic response practice; Gamemakers may select abilities that align with another player's strengths, relationships with other players, or individual needs.

Lastly, the designed rankings and rewards systems also reinforce altruistic action. Users who aid other players rank higher and are more heavily rewarded, subtly emphasizing that altruism is advantageous in this game.

Agency

The final principle I considered when designing the game space began as a study into how perspective might be explored when gamifying role-playing scenarios. Game design precedents suggest many options for perspective, from modern first-person gaming, to The Cat & The Coup's third-person experience as a villain, and SPENT's perspective devoid of [human] presence. Designed features to encourage user agency became an important facet of the designed game experience as features designed to motivate and reward developed. Perspective and early iterations became more about visual explorations that would facilitate players taking ownership of the space of their experience, providing more choice while working towards content objectives, and emphasizing to players that their contribution to the experience is ultimately empowering.

Unlike prior studies, Study 3 relinquished control when facilitating user exchanges within the space. This was achieved by: (1) assigning one user the role of Gamemaker at random, (2) allowing the Gamemaker to choose other players's abilities, (3) allowing users to advance levels without requiring a content objective be achieved, and (4) providing interactive objects and features from which to choose from. (Figure 4.21)

While user agency within the game space is more fully covered in Study 4: Recursive Experience, it is important to note that the content objective to teach, practice, and reward altruistic behavior in role-playing scenarios is augmented by player agency in the game. By providing a structured experience, the aim is to provoke empathic responses that then could lead to developing altruistic behavior. Including user agency in the game also teaches the action of altruism as a behavioral choice by allowing users the choice to participate in altruistic exchanges at all, and from a number of possible actions.

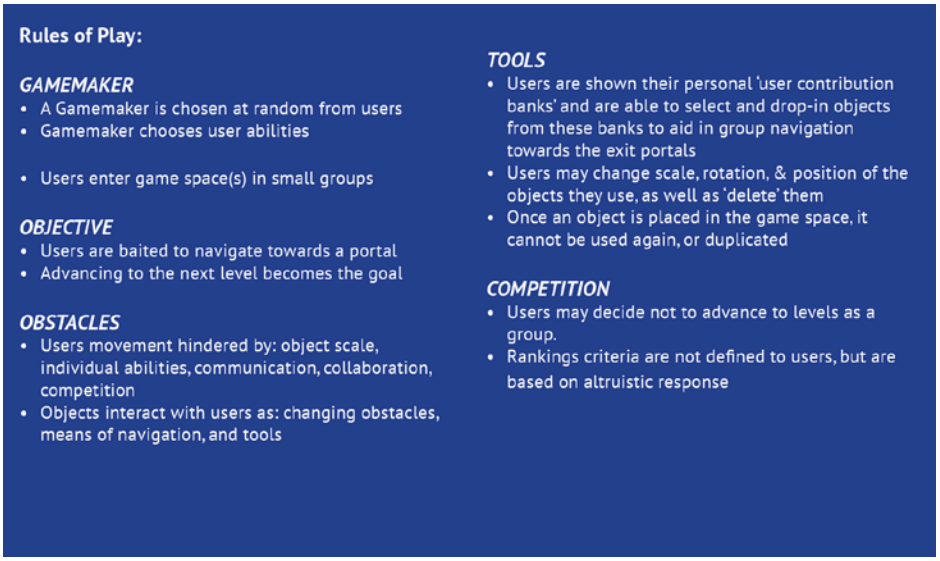


Figure 4.17. *Rules of Play.*

Figure 4.18. *User contribution bank. Shown at the start of each level. Contains objects from a user's participation in prior activities. Bank 'refilled' with objects as reward.*

Figure 4.19. *User rankings. Shown at beginning of each level, Based on altruistic action.*

Figure 4.20.1 - Figure 4.20.3. *Game environments. Based on scenes familiar to the college undergraduate student. Classroom, dorm, party. Note object scale to users.*

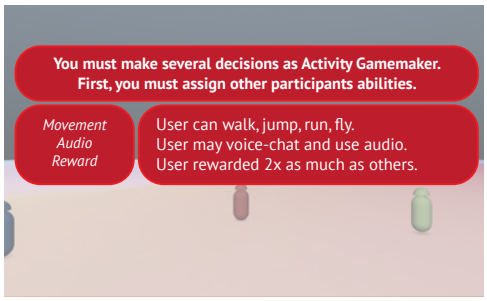


Figure 4.21.1 - Figure 4.21.2. *Gamemaker screens. Top: Gamemaker informed of responsibility to select for participant abilities. Bottom: Gamemaker sleects participant abilities.*

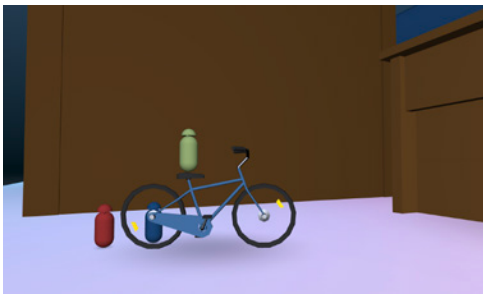


Figure 4.22.1 - Figure 4.22.2. *Players aid one another with their different abilities.*

4.4. Recursive Experience

To investigate how an interactive virtual reality experience might build over time to create a recursive learning experience for empathic skills practice, I developed a series of exploratory studies visualizing how to build in new experiences in the virtual reality space (Figure 4.30).

Within the first three studies, opportunity for new experiences and user contribution were built in. First, dialogue between users on voice-chat becomes a tangible object and necessary part of many activities (Figure 4.23). When dialogue becomes an object for interaction in the virtual reality environment, users can uniquely contribute to the immersive space and experience. Additionally, dialogue has no constraints. In this way, conversations that manifest as objects in the space may be based on experiences, feelings, or reactions to the activities. Finally, these dialogue objects are then used for narrative engagement in Study 1, navigation in Study 2, and advancing to next levels in Study 3.

In the vignette maze in Study 2, users are prompted verbatim to contribute their own experiences as a means of identifying and understanding emotion [presented in Study 1]. Participants use voice-chat to relate their own experiences of alienation, and are rewarded with objects from their stories manifesting in the space to topple the final obstacle (Figure 4.24). In this way, contributing individual experiences results in the generation of artifacts of empathy, relics of the experience of vulnerability and empathic skills practice.

In Study 3, players advance in the game by using objects from their User Contribution Banks (Figure 4.25). The objects in an individual's bank are artifacts of their participation, and are used in the third study in new ways to help the players advance to the next level. The objects in the bank not only reinforce a user's contributions, but allow that participant to use the object as they see fit, in combination with other objects, and scaled or rotated as needed.

Study 3 also features the return of agency in the immersive space to the users. Interactive objects give user the opportunity to engage selectively; there is no one activity or 'right' means of navigating to the 'next level' portal, and the kinds of interactions players may have within the space are compounded by the agency to choose which objects to interact with, and for what purposes.

Additionally, the user functioning as Gamemaker may assign abilities to players that will influence not only the content or even game objectives, but also the kinds of nuanced exchanges and relationships that take place within the

immersive experience (Figure 4.26). In the final level of the game space, the Gamemaker builds the scene through which players must navigate (Figure 4.27). This Gamemaker selects between objects and their interactive features. The Gamemaker is able to facilitate or hinder navigation through this final game space, setting up the kinds of exchanges they wish to see by presenting any combination of objects and object activities (scale, topple, rotate, etc.). In this Studies 3 and 4 hybrid game space, the user functioning as Gamemaker is likely to select objects based on their experiences not only throughout the immersive experience, but also from their own life experiences. A Gamemaker may create an impossible game space because other participants weren't conversational over voice-chat, or an easy win derived from a memory of a frustrating game in their experience.

The opportunities for users to generate their own artifacts, use artifacts already present for new purposes, see their conversations manifest, assign abilities to others, and create a level of a game offers the opportunity not only to build in new, relevant experiences for future participants, but also for these participants to feel a sense of ownership over their virtual reality experience.

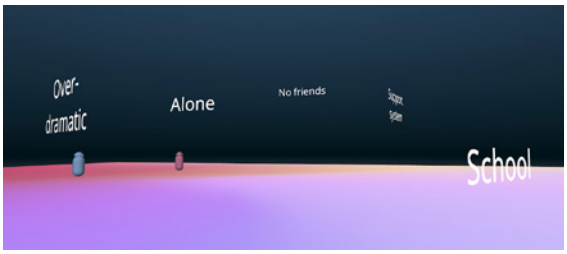


Figure 4.23. *Conversation manifest in Study 1. Dialogue becoming a physical object in the VR space offers users the opportunity to contribute to the environment, and dialogue objects are essential for activity during the immersive experience.*

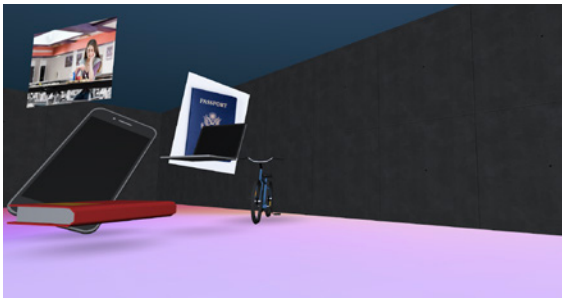


Figure 4.24. *Participant stories generate relevant objects in Study 2. These bojects become essential for game play in Study 3.*

Figure 4.25. *User contribution bank. The banks are an archive of participant contribution in prior activities. The objects in the banks recall prior activity, but are used in new ways in the game space.*

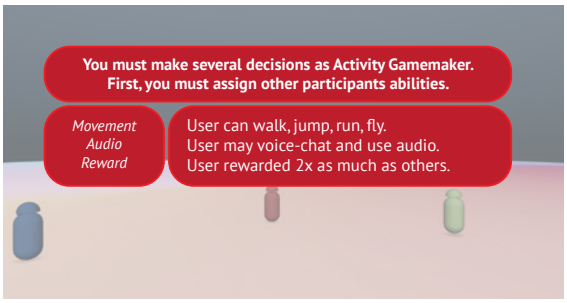
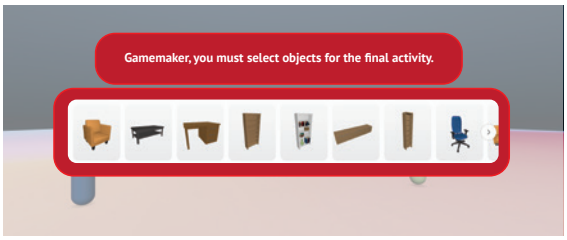


Figure 4.26. *Gamemaker screen. Marked shift from player to director. Selection of abilities may be based on relationships built during prior activities.*



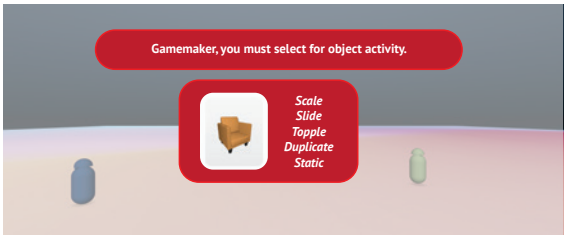


Figure 4.27.1 - 4.27.2. *Gamemaker screen II, III. Marked shift from player to director. Selection of objects for game space.*

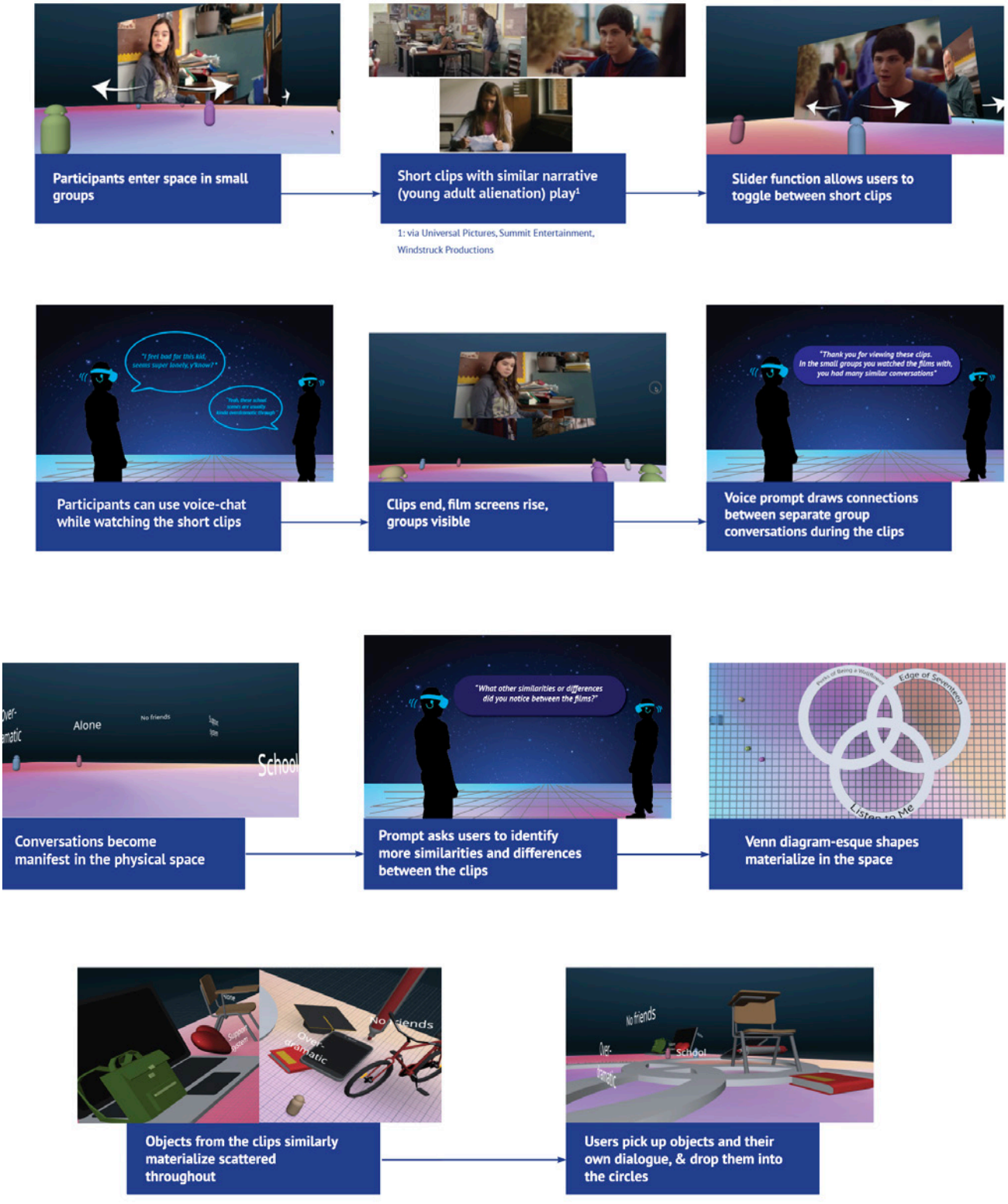


Figure 4.28.1 - Figure 4.28.2. *Study 1: Storyboard. Imagine events based on designed features.*

Figure 4.29.1 - Figure 4.29.4. *Study 2: Storyboard. Imagine events based on designed features. Cont'd next page.*

Figure 4.29.1 - Figure 4.29.4. *Study 2: Storyboard. Imagine events based on designed features.*

Figure 4.30.1 - Figure 4.30.3. *Study 3: Storyboard. Imagine events based on designed features.*

5

Discussion

5.1. Design Principles

During this design investigation, I explored features for the purpose of enhancing cognitive empathy skills through perspective-taking exercises in the virtual reality environment. Through these visual explorations, several compelling and consistent principles emerged as significant outcomes with opportunities for future work:

Ease-of-use informs engagement in the virtual reality environment. Aiding participants in discerning what features of the virtual environment to interact with, how, and for what purpose mitigates confusion or overwhelm in an immersive environment. Designed features in the immersive space should include coaching and facilitation to foster desired interactions within the virtual reality environment. Ease-of-use in the virtual reality environment must also include alleviating visual distractions compounded by 360° viewpoints.

Users may be conditioned to interact with(in) the virtual reality environment. Consistently implementing features and interactions between participants and the virtual reality space reinforces concepts on their use and purpose. Training users to expect an exchange occurs when interactions (and reactions) are consistent over time.

Virtual reality affordances can manifest the abstract. The point of reference that guided this investigation is the affordances of the virtual reality environment over the physical world. Manifesting the abstract allows intangible and important concepts to become manipulable objects for activity as well as artifacts of skills practice. Manifesting abstract emotions, vulnerable experiences, and reflection are valuable uses of the virtual reality affordances to mediate cognitive skills development. The virtual reality format not only allows for the manifestation of abstract concepts, but also improves cognitive processing of these principles.

User agency in the virtual reality environment is inherent but requires intentional supplementation. Users in the virtual reality environment have inherent agency as viewers, but require additional avenues to choose, contribute, and engage. Choice may refer to selection between objects to interact with, or relinquishing power for users to choose their own affordances and activities. User agency in the form of contribution may indicate opportunity to communicate without constraint, generate new content, build relationships, or incorporate lived experiences. Engagement is also a form of user agency in the virtual world, as users have both choice in what or whom they engage with, as well as the agency to refrain from engagement entirely.

User agency in the immersive space instills a sense of ownership. The opportunity for users to contribute to the virtual reality environment suggests improved engagement, motivation, and participation reliant on tangible contribution. Users may be given control of an activity, affordances, or features to instill a sense of ownership over the virtual space and the interactions that play out within. Archives of the experience that emphasize participation, vulnerability, and storytelling experiences may also improve engagement within the virtual environment.

The virtual reality environment facilitates important participant exchanges. The virtual reality environment facilitates desired participation exchanges to further content objectives. Designed features may foster content engagement, recall, and activity, but desired participant exchanges cannot be designed for. Instead, interactions may be set up by designed features in the virtual environment over time. Relationship-building in the virtual environment is as significant for content objectives as many of the designed features.

5.2. Future Work

The design principles that have emerged during the limited time and scope of this investigation suggest opportunity for further study, including user testing, collaboration with an expert in cognitive psychology, and implementation of prototypes within the university setting. This investigation and design principles might also be explored further than the fields of design and [psycho-emotional] soft skills development, into education, professional development, and service fields.

User testing. The visual explorations and outcomes of this investigation are speculative. To determine the efficacy of a cognitive empathic skills module implemented in the virtual reality environment, user testing must occur to support conclusions made in this study.

Recursive Experience. The limited time of this investigation suggests the opportunity for project continuation not only in the form of user testing to research the validity of design principles and success of content objectives, but also to effectively practice empathic skills. Cognitive and emotional development necessitates practice to produce progress.

Opportunity for New Narratives. Creating the opportunity for a recursive user experience might also offer the opportunity for new experiences to be built into the system. Future work may study the necessity of implementing new narratives derived from users' new, lived experiences in order to create applicable activities for empathic skills practice. This opportunity might apply to other fields of study; a means of building in new narratives offers the option to smoothly implement content systematically in order to change the application for unique learning goals.

Relationship-Building. The relationships formed between users in the VR space provide a meaningful chance for future collaborative skills practice. Continuation of this design project may apply these virtual relationships to the physical world or to the recursive experience, studying the effects of collaboration, connection, and trust on empathic skills or other learning objectives.

Implementation. A step beyond user testing, implementation of the interactive, immersive system on the university campus is both an administrative and community opportunity for further research. Logistical conflicts as well as the undergraduate community and their experiences might suggest necessary alter-

ations to the system. Sociocultural attitudes on different campuses might also affect the efficacy of this study and its design principles.

Expanding the Population. This limited scope study is designed for undergraduate first-year students, and features are based on experiences or applications many students may already be familiar with. Project continuation may focus on applying the interactive VR system to other demographics, possibly requiring content and even designed feature changes to adapt to the experiences and interactive features these demographics are comfortable using.

5.3. Conclusion

In this design investigation, I visually explored how an interactive immersive environment might facilitate perspective-taking exercises for cognitive empathic skills practice. I focused on designing the features and facilitating the participant interactions that might improve engagement and reflection based on sourced content. This study synthesizes existing research on the efficacy of storytelling to evoke empathic responses, and the success of virtual reality in creating engaging, emotionally-evocative experiences. This study relies on design features drawn from game design, experimental and immersive theatre, existing soft skills development workshops, and chat rooms. These features have been adapted and augmented for use in the virtual reality environment specifically for the college undergraduate population.

This design investigation addresses opportunities for empathic skills practice specific to the undergraduate first-year experience to augment and sustain prosocial and altruistic behavior in the campus community, including social, learning, and cohabitation scenarios. This investigation also allows users the opportunity to build in new and lived experiences for their own skills practice and for that of future participants.

The precedents for the design features implemented in this investigation are drawn from experiences and applications the undergraduate first-year student may already be familiar with, not only for ease-of-use, but also for building trust, conditioning for interactions within the space, and facilitating appropriate activity. This study addresses the undergraduate experience and content objectives in a way that isn't overdramatic, oversimplified, or obvious, but is appropriate for the first-year undergraduate's cognitive and developmental abilities.

6

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