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EXPLORING THE ROLE OF VIRTUAL REALITY PERSPECTIVE TAKING
ON TEACHERS' COGNITIVE EMPATHY: AN ACTION RESEARCH STUDY

A Dissertation

Presented to the

The Faculty of the School of Education

The College of William & Mary in Virginia

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

By

Dong Bin Shin

February 19, 2021

EXPLORING THE ROLE OF VIRTUAL REALITY PERSPECTIVE TAKING
ON TEACHERS' COGNITIVE EMPATHY: AN ACTION RESEARCH STUDY

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Abstract

Empathy is an important instructor variable that improves learning outcomes by creating a safe learning environment (Herbek & Yammarino, 1990). Advancements in virtual reality technology and 360-degree videography allow individuals to empathize with others through a perceptual illusion called embodiment (Bertrand et al., 2018). The purpose of this mixed-methods action research study was to explore the effect of virtual reality perspective taking (VRPT) on teachers' cognitive empathy. Additional goals included examining how teachers' beliefs about cognitive empathy impacted teacher-student interactions and teaching practices. Lastly, the study sought to understand teachers' perceptions regarding the efficacy of VRPT as a viable, professional development tool. Measurement instruments included Interpersonal Reactivity Index survey, semi-structured interviews, and a focus group discussion. The analysis of data included coding methods as prescribed by Saldaña (2016). After taking the perspective of a student through VRPT, teachers improved their ability to empathize with students. VRPT also allowed teachers to reflect on elements of physicality and student engagement in the classroom. In terms of teaching practices, teachers were able to reflect on lesson pacing, teacher feedback, and lesson set-up. Concerning VRPT's viability as a professional development tool, teachers valued the ability to look around freely, expressed desire for more content, and suggested ways to collaborate with other teachers. Thus, results support the use of VRPT to facilitate empathic educational practices. Limitations and implications of this research are discussed in the final chapter.

EXPLORING THE ROLE OF VIRTUAL REALITY PERSPECTIVE TAKING
ON TEACHERS' COGNITIVE EMPATHY: AN ACTION RESEARCH STUDY

CHAPTER 1

INTRODUCTION

Background

On August 11, 2006, during the Northwestern University’s commencement address, President Barack Obama encouraged graduates to lean on empathy to guide their behavior towards a more caring future.

There's a lot of talk in this country about the federal deficit. But I think we should talk more about our empathy deficit—the ability to put ourselves in someone else's shoes; to see the world through the eyes of those who are different from us—the child who's hungry, the steelworker who's been laid-off, the family who lost the entire life they built together when the storm came to town. When you think like this—when you choose to broaden your ambit of concern and empathize with the plight of others, whether they are close friends or distant strangers—it becomes harder not to act; harder not to help.

(Obama, 2006, para. 20)

The extent to which President Obama behaved in an empathic manner during his presidency may be debatable; however, he makes a convincing argument for the need to think critically about how we view each other and how those views affect our behavior.

Empathy is an ability to understand the thoughts and feelings of others, and to draw upon those understandings to move forward in helping behavior. In the educational context, by seeing the world from a student’s perspective, a teacher may gain deeper insights into students’ school experiences. Effective teachers play a key role in understanding student experiences and

leveraging that knowledge to create effective learning experiences and positive learning environments for every student.

In a cross temporal, meta-analysis study, Konrath et al. (2010) looked at a wide range of American college students who completed at least 1 of the 4 subscales (Empathic Concern, Perspective Taking, Fantasy, and Personal Distress) of the Interpersonal Reactivity Index (IRI) between 1979 and 2009, a total population of 13,737. The results show overall levels of empathy declining over the course of last 30 years. Empathic concern and perspective taking are two subscales of empathy that fell sharply from 1979 to 2009 (Konrath et al., 2010). The decrease in empathic concern and perspective taking is concerning, because there is a strong, positive relationship between high levels of empathy and prosocial behaviors (Eisenberg et al., 2002). Elements of positive relationships and appreciating perspectives of others play vital roles in the lives of students in schools. Regarding student achievement, Hattie (2012) states, “Positive relationships, nondirectivity, empathy, warmth, and encouraging thinking and learning are the teacher variables that have above average effect sizes compared with other educational innovations” (p. 134). When teachers use their understanding of student perspectives and acknowledge students’ emotional states, teachers demonstrate empathic practices, which increases a student’s potential for learning (Durlak et al., 2011).

Statement of the Action Research Problem

In this action research study, I explored the role of perspective taking using virtual reality technology on teachers’ cognitive empathy. Virtual reality perspective taking (VRPT), designed to enable teachers to experience the classroom from a student’s perspective, was examined to determine whether the treatment changed teachers’ cognitive empathy on the IRI. Furthermore, I examined how participating in VRPT training affected teacher beliefs about how cognitive

empathy played a role in teacher-student interactions and teaching practices. Lastly, I sought to understand teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development.

Evidence Supporting the Existence of the Problem

In February of 2018, an online survey was administered by the Henry & Isabelle School's administration to all school stakeholders with the following essential question: How is the school meeting the written mission of the school and what are the areas of improvement? (Mansfield, 2019). Results from the survey indicate 33.75% of students ($N=315$) and 58.28% of parents ($N=326$) perceived that the school's culture and climate both reflect and support the School's mission of meeting the needs of every boy (Mansfield, 2019). Parents point to a need for Henry & Isabelle School teachers to model the character traits and principles of the school mission. Families state that students notice when teachers expect more professional behavior from their students, than they demonstrate for themselves (Mansfield, 2019).

Durlak et al. (2011) stated:

interpersonal, instructional, and environmental supports produce better school performance through peer and adult norms that convey high expectations and support for academic success, caring teacher-student interactions that foster commitment and bonding to school, and engaging teaching approaches and safe and orderly environments that reinforce positive classroom behavior. (p. 418)

Teachers who thoughtfully plan and deliver instruction and care deeply about students provide their students best chances to succeed.

In 2015, the Every Student Succeeds Act (ESSA) replaced No Child Left Behind Act (NCLB). Moving away from federal test-based accountability system of NCLB, ESSA requires

states to include a school quality and student success measure, which can encourage states and school districts to see student health as part of overall school success. ESSA's Student Support and Academic Enrichment Grants can be used to promote student health, including mental health services (R. Davis & Weisz, 2019). In fact, a review of U.S. school practices found that 59% of schools already have in place programming to address development and support of children's social and emotional competencies (Foster et al., 2005). In a national sample of 148,189 sixth through 12th graders, 29% indicated that their school provided a caring, encouraging environment (Benson, 2006), which suggests 71% of 148,189 students did not perceive their school to be a caring environment. Given findings such as this, it appears that U.S. schools, including Henry & Isabelle School, are not fulfilling their role of creating healthy, learning environments for all children and, when we try, we are failing.

As Wheatley (2006) contends, leaders must expand their organization's ability to see and feel the lived experiences of others. It is the responsibility of school leaders to help teachers build their capacity to understand and feel the lived experiences of their students. Teacher empathy may build caring and encouraging learning environments that move teachers towards positive, teacher-student interactions and high-quality instructional practices.

The application of empathy in the educational context is a process that includes acquiring knowledge and using that knowledge to guide one's professional decision-making (Warren, 2014). Empathy may be leveraged to connect students to teachers, allowing teachers to respond effectively to students' learning needs (McAllister & Irvine, 2002). Teachers come to their classroom with their own subjective points of view, prejudices, biases, and personal experiences, all of which inform their approach to instructional planning and instructional delivery. It is important to align teacher perceptions with the needs of students to develop meaningful teacher-

student interactions and improve teaching practices that ultimately lead to more student learning (Warren, 2014).

Perspective Taking and its Relationship to Empathy. Psychologists have demonstrated that the capacity for perspective taking is strongly correlated with empathic behaviors (Batson et al., 1995; Pierce et al., 2013). There is empirical evidence demonstrating that the ability to see the world from another's perspective may lead people to volunteer time and resources to help individuals facing hardship (Batson et al., 1991). Perspective taking is foundational in terms of empathic concern and therefore represents the core of empathy in social relationships (Batson et al., 2007). Teachers who practice perspective taking are more amply prepared to understand and feel the social and intellectual needs of all students.

Potential Role for Virtual Reality in Enhancing Empathy. Virtual reality has been referred to as the “ultimate empathy machine” since it allows users to experience novel environments from any person's point of view (Herrera et al., 2018, p. 1). Virtual reality technology allows users to experience immersive environments where people can move around freely and interact with their surroundings. Virtual reality technology allows users to replace real world perceptual inputs with perceptual inputs from a virtual world and make users believe they are actually inside the virtual environment (Herrera et al., 2018).

Herrera et al. (2018) explored the effectiveness of VRPT compared to traditional perspective taking. Results from the experiment demonstrate over the course of eight weeks participants in both conditions reported feeling empathetic and connected to their target subject; however, participants who experienced the subject's conditions in virtual reality had more positive, longer-lasting attitudes toward the subjects and moved helping behavior at a significantly higher rate than participants who performed a traditional perspective-taking task

(Herrera et al., 2018). Although there is empirical evidence for VRPT to increase empathy (Bertrand et al., 2018; Herrera et al., 2018; Schutte & Stilinović, 2017), there is a need to better understand how this technology may be leveraged as an effective professional development tool for teachers in educational settings.

Through this study, I aimed to understand how VRPT may reduce or eliminate the need for teachers to expend cognitive empathic effort by providing a virtual reality experience where participants literally position themselves in the subject's perspective. Easing the cognitive burden of perspective taking by leveraging VRPT allowed teachers to develop more positive teacher-student interactions and more empathic, teaching practices.

Context of the Action Research Study

In 1931, the Reverend Dr. Winston Washington founded the Henry & Isabelle School in the southeastern region of the United States. In 2012, under the leadership of David Runwell, Henry & Isabelle School established its new vision statement, which set goals for all members of the school. In the vision statement, the school identified five key strategic priorities for every student: creative thinking, technological savvy, intellectual risk taking, global engagement, and empathy and collaboration (Henry & Isabelle School, 2019).

Information Related to the Organization. Henry & Isabelle School, located in the southeastern region of the United States, is comprised of a lower school, a middle school, and an upper school. At the time of this study, total student population of Henry & Isabelle School was 971. There are 181 full and part-time faculty members with an average tenure of 12 years. The school offers 150 distinct course offerings, 24 Advanced Placement courses, 21 performing arts groups, and 48 athletic teams. Henry & Isabelle School is college-preparatory school, accredited by Virginia Association of Independent Schools, and the National Association of

Independent Schools. There is a strong emphasis placed on the significance of weekly, chapel service rooted in Episcopalian Christian values. The tuition for 2018 through 2019 was between \$16,450 and \$25,175 for lower school, \$26,550 for middle school, and \$28,225 for upper school, and 27% of the student population received need-based financial aid. There were \$64 million in endowment funds as of August 2018.

Information Related to the Intended Stakeholders. The VRPT training to be studied was intended to support teachers in increasing their levels of cognitive empathy and thereby to improve teacher-student interactions and teaching practices related to cognitive empathy building. The focus of the study was that students and teachers should ultimately benefit from a school climate that is predicated on cognitive empathy.

Theoretical Framework

The theoretical framework for this study draws from Bertrand et al. (2018) research on the immersive nature of VRPT on developing empathy. The pragmatic perspective supports the use of mixed methods approach in data collection, allowing the use of qualitative and quantitative data (Mertens & Wilson, 2012). Participants in this study leveraged a reflective approach to observe changes in empathy and the subsequent effect on their interactions with students and their instructional practice. The reflective approach is grounded in the works of Dewey (1933) who described reflection in education as “active, persistent, and careful consideration of belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it ends” (p. 9). Collecting qualitative and quantitative data provide a more complete picture of VRPT experiences and its impact on teachers’ level of empathy and their reflection about teacher-student interactions and teaching practices. Data

collected from interviews and a focus group discussion will also provide an understanding of teachers' perceptions regarding the efficacy of VRPT as a means of professional development.

Action Research Questions

The purpose of this mixed-methods action research study was to explore the effect of VRPT on teachers' cognitive empathy. Additional goals included examining how teachers' belief about teacher-student interactions and teaching practices were affected by VRPT. Lastly, I sought to understand teachers' perceptions regarding the efficacy of virtual reality as a viable, professional development tool. The central research questions that served to guide this study included the following.

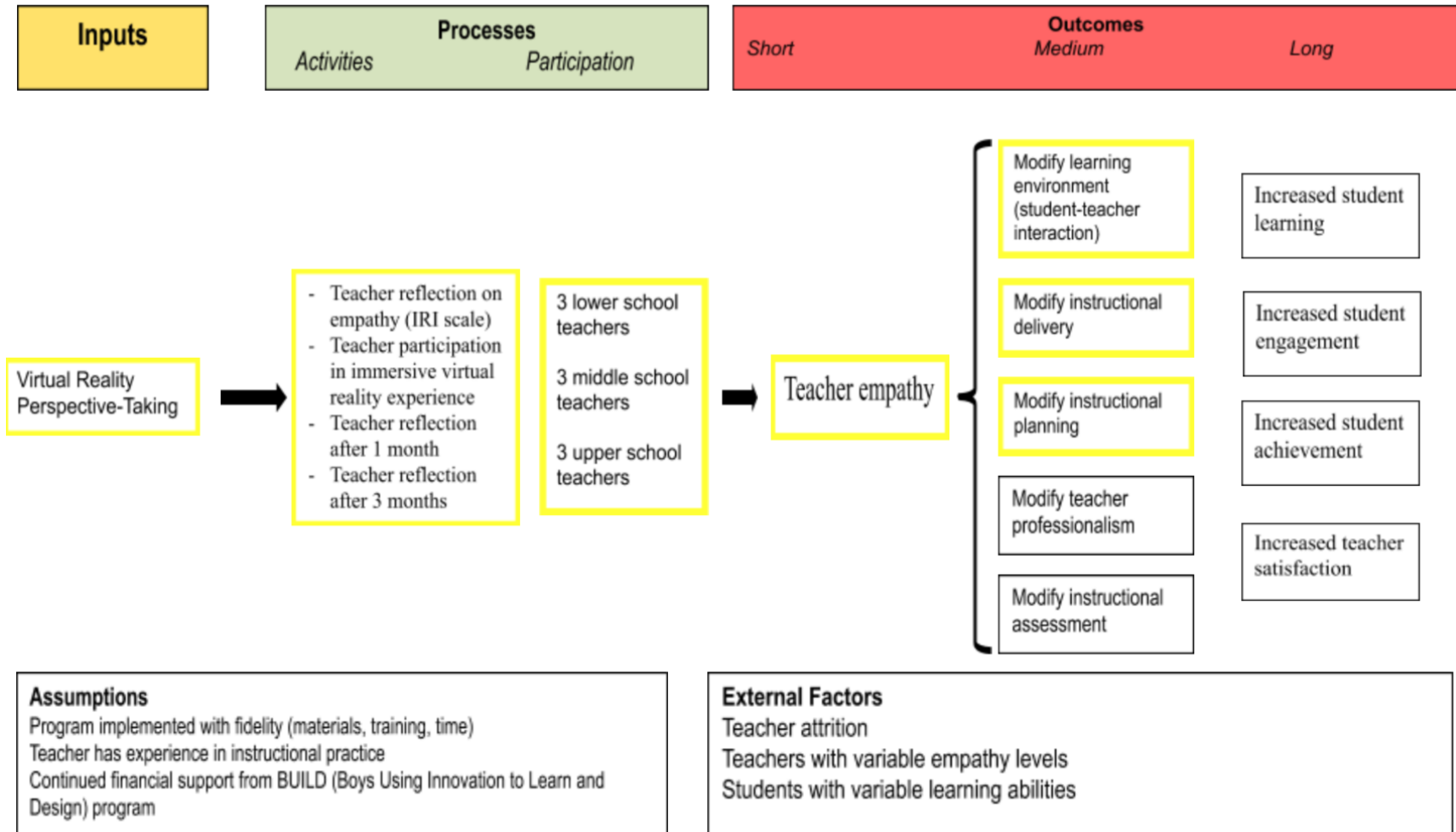
1. To what degree does teachers' cognitive empathy toward students change after receiving VRPT training focused on empathy building?
2. What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?
3. What are teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?

Action Research Model

VRPT is a multisensory and multidimensional experience designed to provide teachers a first-person experience as a student in the classroom. Teachers' cognitive empathy may lead to changes to their teacher-student interactions and instructional practice, which may lead to changes in student learning.

Figure 1

Logic Model of Virtual Reality Perspective Taking (VRPT)



Note. This logic model illustrates the process of VRPT action research study at Henry & Isabelle School.

Brief Description of the Intervention

The focus of the action research study was the perception of Henry & Isabelle School's teachers regarding their participation in VRPT. Participants' perceptions involved their levels of empathy, beliefs about teacher-student interactions, and teaching practices. Each VRPT began by showing a student sitting in front of a desk by himself. Then the student began to move his arms slowly and gave the participants an opportunity to embody the subject. The next scene was the student going through an ordinary lecture in a class. In the next scene, the participant experienced a one-on-one conversation with a teacher as the subject. Lastly, the participant experienced working in a small group setting.

First Cycle. I designed and created six videos, one with a lower school student, one with a middle school student and one with an upper school student. Each video consisted of a 10-minute recording using a stereoscopic, 360-degree camera with 4K resolution. The camera was mounted on a tripod in front of a student for two reasons: to provide an eye-level perspective of the student from three different scenes, and to provide image stabilization. VRPT will provide teachers the ability to view a 360-degree recording of the classroom space from a student's perspective through a virtual reality headset. VRPT is different from watching a traditional, two-dimensional video, in that, teachers have the ability turn their heads at any time throughout the video to focus on any aspect of the classroom, for any duration.

Second Cycle. The focus of this study took place in the second cycle of the action research. As the researcher and facilitator, I facilitated VRPT experience with participants. Each participant completed the IRI survey, then experienced VRPT using a virtual reality headset. After VRPT, participants took the IRI survey again to answer Research Question 1. Following post-IRI survey, I conducted semi-structured interviews with each participant. After a month, I

held a focus group meeting with all participants. Semi-structured interviews and a focus group discussion were used to triangulate findings.

Third Cycle. During the third cycle, researcher may analyze data on empathic teacher behaviors. Teachers may reflect on the level of empathic behaviors after experiencing VRPT. Changes to teacher behavior may lead to more student learning.

Definitions of Terms

Effective teacher demonstrates model practice in professional knowledge, instructional planning, instructional delivery, assessment, learning environment and professionalism to make extraordinary and lasting impact on their students' lives (Stronge, 2018).

Teachers' cognitive empathy is the teacher's ability to understand what students might see and feel in the classroom, and use that knowledge to move towards helpful behavior (Decety, 2010).

Immersive Virtual Reality refers to tridimensional environments with immersive visual interfaces, such as Oculus Go (Bertrand et al., 2018).

Perspective-Taking is a cognitive and an emotional activity, which allows people to overcome their usual egocentrism, tailoring our behavior to others' expectations (M. Davis, 1980).

Virtual reality perspective taking (VRPT) is an activity designed to take on the cognitive and emotional state of another using an immersive visual interface (Herrera et al., 2018).

CHAPTER 2

REVIEW OF RELATED LITERATURE

Research related to empathy considers the construct as a cognitive or as an affective phenomenon (M. Davis, 1983; Decety, 2010; Riess, 2017). Cognitive empathy is an intellectual reaction, which is an ability to understand the other person's perspective. Davis (1983) explains that perspective-taking is the cognitive capacity to consider the world from other viewpoints and "allows an individual to anticipate the behaviors and reactions of others" (p. 115). Emotional empathy refers to the ability to feel another person's emotions. Theories on cognitive empathy's role in the development of positive, social behaviors suggest possible connections to its application to teacher-student dynamics in schools.

It is often believed that people are born with a certain degree of empathy and that amount cannot be altered throughout the individual's life (Krznaric, 2014). As this literature review on empathy will demonstrate, empathy can be learned, exercised, and eventually demonstrated at a higher level. The focus of this research design is to study the effect of VRPT on teachers' cognitive empathy, as it relates to teacher-student interaction and instructional practices. Specifically, the review of related literature included in this chapter is organized into major sections: (a) History of Empathy, (b) Positive Effects of Empathy, (c) Negative Effects of Empathy, (d) Empathy and Its Relationship to Teacher Perspectives and Practices, (e) Teacher Training on Empathy, (f) Virtual Reality, (g) Professional Development Using Virtual Reality, (h) Virtual Reality in Teacher Education, and (i) Summary.

History of Empathy

The view of empathy as an innate, human nature has not always been the norm. During the 18th century, the economist Adam Smith played a role in shaping how we understand human relationships through the lens of economic reform. Smith suggests by pursuing one's own interest, he or she promotes and meets the needs of the community more effectively than when one really intends to promote it (Krznaric, 2014). This view on human relationships offers an economic and a political justification for acting in accordance with one's self-interest. Smith's views were popular with business and political elites during the Industrial Revolution (Krznaric, 2014) and remain popular today.

The naturalist Charles Darwin played a significant role in shaping Western civilization's view on human relationships. In his seminal book titled *On the Origin of Species*, Darwin (1859) affirmed Smith's views on human nature and reinforced the narrative about innate human selfishness: competition rather than cooperation was the driver of our evolutionary history (Darwin, 1859). Darwin created the theory of natural selection, in which, through competition, only those who are best fit for their environment survive and pass their genome to the next generation.

Another key figure whose work helped support the self-centered narrative was the pioneering psychologist Sigmund Freud. Freud believed that human beings were not sensitive creatures (Freud, 1961). He argued that humans, even as babies, have a ruthless drive to seek their self-interest. Freud believed that without adequate controls, man becomes "a savage beast to whom consideration of his own kind is something alien" (Freud, 1961, p. 58). The message on human nature by works of Smith, Darwin and Freud is clear: self-interest defines the thoughts

and behaviors of humankind. This philosophy has been ingrained in Western culture in the last three centuries.

In the early 20th century, Robert Vischer, was the first person to use the word “*emfühlung*”/empathy to describe how human beings might appreciate art, by “feeling into” it (Beam, 2018, p. 65). Vischer suggests, rather than intellectually deducing art with precise measurements through physical observations, empathy allows people to feel the emotions resonating from the artwork, recognize the feeling within the viewer, then come to understand the experience within the artist (Beam, 2018). From the first usage of the term *empathy*, the concept of empathy has been used to describe one person attempting to understand and to feel with someone else’s thoughts and emotions.

Research about empathy prior to the 1980s came from the field of psychology. Carl Rogers, a psychologist, developed a new method of psychotherapy where the focus was on “unconditional positive regard” towards clients (Rogers, 1957, p. 208). Rogers stated “unconditional positive regard” is the ability to accept the patient’s negative, painful, abnormal, fearful, defensive feelings, as much as, positive, mature and confident feelings (Rogers, 1957). “It means caring for the client as a separate person, with permission to have his own feelings, his own experiences” (Rogers, 1957, p. 98). Within the framework of this concept, the ability to understand and communicate the patient’s state of mind, and to identify and feel the emotions of the patient without his own anger, fear or confusion was central to demonstrating empathy (Rogers, 1957).

Recent developments in neurobiology have changed the perception of empathy from a soft skill to a neurobiologically based competency (Riess, 2017). While people are either imitating or simply observing emotional facial expressions, activation of a similar network of

brain areas occurs in the observer (Riess, 2017). This cognitive response also initiates observers' own emotional content and motivates affective, empathic responses. Functional magnetic resonance imaging now demonstrates the existence of a neural relay mechanism that allows individuals to exhibit unconscious mimicry of the postures, mannerisms, and facial expressions of others to a greater degree than individuals who are unempathetic (Carr et al., 2003). In essence, people demonstrating higher empathy levels are able to mimic aspects of others more closely than those who cannot empathize at the same level.

Positive Effects of Empathy

Research on empathy highlights benefits of designing a more empathic environment. Specifically, empathy leads to helpful behavior (Decety, 2010; Eisenberg et al., 2010). Eisenberg et al. (2010) state “evidence of empathic responding (i.e., offering help or comfort to another in distress) has been observed in children as early as the second year of life” (p. 71). Empathy is a critical variable in allowing one to better understand the other, learn from other's actions, and eventually provide help (Decety, 2010).

Greater empathy improves interpersonal relationships (Jordan & Schwartz, 2018). Jordan and Schwartz (2018) challenge prevailing western theories of psychological development, which emphasize the importance of increasing autonomy, independence, and enhancing the ability to “stand on one's own two feet,” and make a case for “mutual empathy” (Jordan & Schwartz, 2018, p. 26). According to neuroscience on empathy, pain of social exclusion activates the same areas of the brain as the pain of physical injury, starvation, or loss of oxygen (Jordan & Schwartz, 2018). Jordan and Schwartz (2018) state that through healthy, positive relationships, we experience five good things: “zest, worth, clarity, knowledge of self and other, and desire for more connection” (Jordan & Schwartz, 2018, p. 26).

Greater empathy improves collaboration (Decety, 2010). In *Leadership and the New Science*, Wheatley points out our tendency in organizations to enforce quick solutions, rather than leverage the power of each other (Wheatley, 2006). As new, unforeseen variables enter organizations, Wheatley recommends relying on the power of each other, to think critically, and collaboratively, instead of rushing to arrive at a false stabilization (Wheatley, 2006).

Negative Effects of Empathy

As empathy is regarded as an essential human trait in literature, there are scholars who challenge to what extent empathy may drive human behavior. Bloom (2016) makes a case for rational compassion, over empathic concern. He believes there are issues in the world that do not require direct, empathic concern to produce helping behavior. There are those who are acting to make the world a better place for all of us, who worry that we are making the planet hotter, running out of fossil fuels, or contaminating the environment or failing to respond to the rise of extreme religious groups (Bloom, 2016). These issues cannot be resolved by having any level of empathy, because the issues fundamentally are not bound by human relationships. Bloom (2016) contends, empathy at best, only occasionally serves as an enhancer or motivator of effective and moral behavior and is just as often, demonstrates a negative effect on human behavior. He further makes this case by stating many psychopaths show a high degree of empathy for those they ultimately victimize, and therefore, empathy is an amoral human ability that can be used for good or bad purposes (Bloom, 2016).

Batson et al. (1995) conducted an experiment to understand the effect of empathy on human behavior. One group of participants received specific information about a 10-year-old girl, intended to cause readers to empathize with her as a patient longingly awaiting her kidney transplant. Another group did not receive more information about anyone in particular. Both

groups were given a list of patients and asked if they would allow the 10-year-old girl to be moved to the top of the transplant list. Participants who were not induced to feel empathy tended to act in accordance with fairness; participants who were induced to feel empathy were significantly more likely to violate the principle of fairness, providing preferential treatment to the person for whom empathy was felt (Batson et al., 1995).

In *The Most Good You Can Do: How Effective Altruism is Changing Ideas About Living Ethically*, Singer (2015) warns against the idea of losing rationality in light of empathic concern for a select few. Singer describes Zell Kravinsky, who donated a \$45 million fortune to charity. Donating was not enough for Kravinsky. He realized that by donating his kidney he could reduce someone's risk of dying 4,000 times compared to someone who did not receive a kidney transplant. Kravinsky was not moved by understanding a patient's cognitive or emotional state. Rather, he decided to donate his organ because his action over inaction would greatly improve the survival rate for another person (Singer, 2015). One could argue that this type of behavior was simply a mathematical decision based on rationality and not connected to empathy.

Empathy and Its Relationship to Teacher Perspectives and Practices

In *Qualities of Effective Teachers*, Stronge (2018) builds a list of six qualities of an effective teacher: professional knowledge, instructional planning, instructional delivery, assessment, learning environment, and professionalism. According to Stronge (2018), when teachers are hired, trained, and supported with those qualities in mind, student learning will improve. Students may enter the classroom with various levels of expertise, and it is ultimately the teacher's responsibility to understand those needs and address individual needs to maximize student learning (Bullough & Hall-Kenyon, 2012). When teachers are better able to reflect and

understand the process behind student-learning, they are better equipped to change their instructional behavior.

Empathy may seem like a soft-skill and difficult to correlate directly with student learning. However, when this variable is embedded in teaching practices, student learning gains are significantly higher (Sadler et al., 2013). Sadler et al. (2013) found that teachers who know their students most common misconceptions are more effective than teachers who do not. Writers also purport deeper content knowledge may demonstrate limited effectiveness. They conclude it is better if a teacher has a model of how their students tend to learn a particular concept (Sadler et al., 2013). Drawing from his analysis of data on expert teachers in their use of common instructional practices, Stronge (2018) concludes “expert teachers consider students thinking in order to assess the success of the lesson plan and then modify their instruction promptly” (p. 155). Adapting lesson plans to the needs of students allow teachers to implement meaningful additional practice and demonstrates empathic, instructional planning for improved student learning outcomes.

Teacher Training on Empathy

Research demonstrates empathic teachers are more effective in inspiring students to change poor work habits and to learn than non-empathic teachers, because they are more likely to connect with their students (Lam et al., 2011). Herbek and Yammarino (1990) have demonstrated that empathy is an important instructor variable that positively affects learning outcomes by creating a psychologically safe learning environment. If empathy is an important variable for producing positive learning environments, and ultimately enhances student learning, it is logical to see if teacher training may lead to changes in empathic ability.

From 29 studies on empathy training, Lam et al. (2011) classified empathy training under seven types: (a) experiential, (b) didactic and experiential, (c) skill, (d) didactic and skill, (e) mindfulness, (f) video stimulus, and (g) writing. In terms of teacher empathy training, didactic and experiential training, skill training, and video stimulus training were reviewed in the study (Lam et al., 2011).

Experiential training for empathy emphasizes gaining experience on the part of the trainees to be a critical factor in meaningful learning. Instructors are facilitators who design experiences for trainees, and there is no lecture in addition to the experience. Kolb (1984) referred to his model of the Reflective Learning Cycle, consisting of four distinct phases of training after experience training. Participants (a) reflect on the experience, (b) formulate guiding principles, (c) apply their learning, and (d) receive feedback. In didactic and experiential training for empathy, a facilitator lectures on theory and concepts on empathy then provides experiences for the participants through activities. Leveraging didactic and experiential training, Aspy et al. (1984) observed an improvement in teachers' interpersonal skills, including levels of empathy, and in classroom performance of students they taught. McConnell and Le Capitaine (1988) note, after participating in didactic and experiential empathy training, teachers increase their levels of empathy, interactions with students, and openness to students' ideas and responses. In skill training for empathy, a facilitator provides trainees with a description of well-defined skills to be learned, model those skills, then provides practice opportunities using skills learning (Lam et al., 2011). Higgins et al. (1981) found that skill training increased preservice teachers' empathic scores. In video stimulus training for empathy, a facilitator asks the participants to watch a video about others' empathic behaviors, or their own in mock situations, and to respond to pre-written

prompts throughout the video. Warner (1984) found an increase in teachers' empathic responses towards students using video stimulus training.

Lam et al. (2011) used narrative review method to analyze 29 studies of empathy training in human service and social science disciplines over 30 years to address how people have been trained in empathy; 93% of the studies reported positive findings, in terms of learning empathy. The collective findings from research suggest that levels of empathy may be changed through training. Meta-analysis may be generalizable due to its large population size, which increases statistical power. However, unlike action research, it lacks contextual information, which may raise issues with validity when applied to specific settings.

Virtual Reality

Virtual reality refers to a simulated reality, which is built with computer systems by using digital formats (Martín-Gutiérrez et al., 2016). Rosenblum and Cross (1997) state there are three key aspects directly associated to any virtual reality system: immersion, interaction, and visual realism. Immersion, or presence, is created by various sensor input technologies and devices (Wu et al., 2015), for example, virtual headset, gloves with movement sensors, surround sound, and any other element creating sensorial stimuli permitting the user to interact with a virtual environment as in a real environment. Leveraging various sensorial stimuli, virtual reality systems may produce immersion of the user in a virtual environment, which is categorized as sensory-motoric, cognitive, and emotional (Björk & Holopainen, 2004).

The perception of immersion also requires interaction so that the user experiences instant feedback of his or her movements, position and sensations (Martín-Gutiérrez et al., 2016). Output devices (visual, aural, or haptic) should create a realistic illusion so that hardware and software should be able to render detailed and realistic virtual scenarios (Martín-Gutiérrez et al.,

2016). “With virtual reality, users have a 360-degree canvas to step into, instead of passively watching a narrative unfold from outside the frame” (Shin, 2018, p. 65). The desire for better immersion in computer-simulated environments has driven growth in the market for immersive technologies (Violante et al., 2019). In recent years, virtual reality devices have decreased in size and price, making them more accessible to a broader population. The transition from an expensive, physically permanent device to a light, cost-effective price point improves the likelihood of experiencing embodiment for mass users (Bertrand et al., 2018).

Just as cognitive empathy, also called perspective-taking, enables us to learn from others’ thoughts and feelings, virtual reality allows individuals to step into someone else’s shoes, through a perceptual illusion called embodiment (Bertrand et al., 2018). Maselli and Slater (2013) have shown that a combination of physical stimuli may promote strong embodiment illusions. The most explored physical stimuli inducing embodiment are visuomotor synchronicity, seeing oneself in the body of an avatar that mimics one’s movement in real time, and visuotactile synchronicity, seeing tactile stimuli applied to the subject on the screen while it is applied to the hidden part of the user with the subject in a congruent posture with the subject (Bertrand et al., 2018). Sound manipulation techniques have also shown to stimulate embodiment (Bertrand et al., 2018). Evidence suggests that feedback of biosignals such as a heartbeat may also enhance embodiment illusions (Suzuki et al., 2013). Other than the quality of the sensory feedback in the virtual environment, the feeling of presence or embodiment is dependent on the quality of the narrative and on the individual’s characteristics (Baños et al., 2004).

Professional Development Using Virtual Reality

Recently, virtual reality has enabled embodied learning experiences for various professions. Nursing students enrolled at the Penn State University World Campus are using 360-degree videos in their first level nurse education studies to help students empathize with elderly people by identifying unsafe spaces through first-person perspective (Dawson, 2017). In the medical field, doctors who used 360-degree virtual reality training outperformed doctors in the traditional video training when learning surgical knot typing skills (Yoganathan et al., 2018). Violante et al. (2019) designed engineering learning material of an entrepreneurial course with the application of 360-degree videos. Engineering students experience higher levels of concentration, interest, and enjoyment and these fostered optimal learning (Violante et al., 2019).

Virtual Reality Perspective Taking. Schutte and Stilinović (2017) investigated whether VRPT could elicit greater empathy compared to a two-dimensional format video. Results indicated that participants who viewed a documentary using a virtual reality headset demonstrated higher levels of empathy for the subject in the video compared to participants who viewed the same documentary in a two-dimensional format (Schutte & Stilinović, 2017). Results from this study may lack reliability with a bigger and more diverse sample size, since this study included 24 university students from one Australian university. Van Loon et al. (2018) explored whether the effect of VRPT is driven by increased empathy and whether the effect extends to real life. Researchers found VRPT experience successfully increased participants' subsequent propensity to take the perspective of their partner (Van Loon et al., 2018). Results from this study may also lack reliability and generalizability in other contexts, as the population age only ranged from 18 to 29 and included 180 people.

Possible Unintended Consequence of VRPT. Batson et al. (1995) conducted an experiment to understand the effect of empathy on human behavior. As mentioned above about a young patient who received preferential treatment from empathic donors, empathy may lead people to move toward preferential and amoral behavior (Batson et al., 1995; Bloom, 2016). After a teacher empathizes with a particular student in the classroom, he or she may provide unfair, preferential treatment toward that student. Teacher fairness may be influenced to provide preferential treatment towards the students filmed in VRPT training.

Virtual Reality in Teacher Education

Effective teachers grow and learn as they expect their students to grow and learn in their classrooms. For teachers to continually develop their craft for the benefit of students, it is important for them to invest in their education as well as in the education of their students (Stronge, 2018). Effective teachers regularly work to improve lessons, think about how to reach particular children, and seek and try out new approaches in the classroom to better meet the needs of their students (Stronge, 2018). Most higher education is traditionally conducted in non-immersive settings where the students learn contextual information in a decontextualized situation (Winn & Windschitl, 2000). Virtual reality provides users with the ability to work hands-on and view objects from multiple viewpoints, which can potentially deepen learning and recall for the viewer (Hanson & Shelton, 2008).

Results from Theelen et al. (2019) on the effect of 360-degree video on pre-service teachers' professional interpersonal vision indicate that pre-service teachers who participated in the immersive experience improved in noticing classroom events and in applying a more theory-based terminology to describe these events. Walshe and Driver (2019) explored how the use of 360-degree video, also referred as virtual reality perspective taking, may support teacher

reflection. Results indicate that the immersive, embodied experience of reflecting using 360-degree video may develop a more nuanced understanding of microteaching practice, as well as support teacher efficacy towards teaching (Walshe & Driver, 2019). Ibrahim-Didi (2015) suggests that most initial teacher training fail to recognize the situated nature of reflection, which can restrict the ability of teachers to translate reflection into action and change their practice. In examination of 360-degree video on its ability to support teacher reflection, Barton and Ryan (2014) state that watching 360-degree video of lessons heightened teachers' visceral bodily consciousness in the space and time of the teaching, supporting them to actively construct new meaning. The immersive and situated approach is critical in supporting reflection-in-action, rather than reflection-on-action, by drawing on the concept of embodiment (Walshe & Driver, 2019). The situated experiences of teachers within the space and time of their classroom teaching construct enhanced understanding (Lakoff & Johnson, 1999). Walshe and Driver (2019) also note that the technology has implications for broader higher education practice, as it facilitates student-centered, research-based, active learning, which are current ideals in higher education contexts.

Summary

“Empathy has the power to transform our difficult and emotional experiences towards positive ends, and empathy also has the power to connect us to others in ways that foster productive action that works to improve our collective wellbeing” (Parkin, 2015, p. 7). Given the importance of empathy's role in positive social behaviors, it is important to understand how teachers at Henry & Isabelle School may build empathy towards students through research-based methods, namely VRPT.

A synthesis of literature about empathy and VRPT compelled this action research study. VRPT designed to allow participants to experience school from a student's perspective enhanced participant's understanding of school experience for students and position them to effectively meet unmet and unarticulated needs of all students.

CHAPTER 3

METHODS

The purpose of the study was to understand the effect of perspective-taking using virtual reality technology on teachers' cognitive empathy and teacher's beliefs about the effect of cognitive empathy on teacher-student interaction and teaching strategies. I also sought to understand the efficacy of virtual reality perspective taking as a means of teacher development. This action research study was conducted among six teachers from Henry & Isabelle School in Richmond, Virginia. The central research questions guiding this study included the following.

1. To what degree does teachers' empathy toward students change after receiving VRPT training focused on empathy building?
2. What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?
3. What are teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?

This chapter highlights rationale for choosing action research, role of the researcher, participants, design features of VRPT as applied in the study, sources of data, data collection and analysis, delimitations and limitations of the study, and ethical considerations.

Rationale for Choosing Action Research

Action research is a research discipline used by researchers, who take an evidence-based action to solve real problems of practice (Mertler, 2019). It is a process that allows researchers to

engage in the setting in which they conduct the research, allowing them to take an active role in understanding the world through a social perspective and through personal experiences within the setting. An important aspect of an action research design is to allow participants to make mistakes throughout the process and learn from them (Mertler, 2019). Therefore, this study design leveraged multiple cycles of activities including: problem identification, proposed solution, trial of the proposed solution, analysis of the findings, reflection on the worthiness of the solution, and then further cycles until the appropriate solution is fulfilled (Casey & Evans, 2017; Mertler, 2019). This mixed-method action research design allowed flexibility for Henry & Isabelle School teachers to reflect on their levels of empathy and to understand how empathic teacher-student interactions and empathic teaching practices, may ultimately lead to student learning. Participants from Henry & Isabelle School experienced relevant variables from inside the environment, and obtained authentic, and relevant data to their context. The combination of quantitative and qualitative data collection methods improved my ability to provide responses to research questions with accuracy.

Within the study design, I positioned myself as a researcher-participant. I collected data from participants and interpreted meaning from data in the context of VRPT training. The influence of VRPT on teachers' cognitive empathy and the subsequent effect on teacher-student interactions and teaching practices was studied in an ongoing and cyclical manner.

Description of the Action Research Intervention. VRPT was an experiential training model, which leverages gaining experience in a particular phenomenon to serve as a critical factor in meaningful learning (Kolb, 1984). Inspired by embodiment studies (Ahn et al., 2013; Bertrand et al., 2018; Herrera et al., 2018), VRPT allowed participants to see themselves in the body of other human beings by experiencing a 360-degree, virtual world from the first-person

perspective using a virtual reality headset. Embodiment is a process where the participants begin to experience virtual reality as the subject, blurring the lines between reality and virtual reality. Each experience leveraged visuomotor synchronicity and visuotactile synchronicity to promote embodiment, interaction and visual realism effect (Bertrand et al., 2018; Wu et al., 2015). Taking the perspective of the subject, participants are better equipped to understand how the subject experiences their environment, thereby improving their ability to empathize with the subject.

Teachers at Henry & Isabelle School engaged in a VRPT experience, which I designed and created. Lower school teachers experienced their own classroom, as well as two other teachers of their choice. Middle school teachers experienced their own classroom, as well as two other teachers of their choice. And upper school teachers experienced their classroom, as well as two other teachers of their choice. Teachers kept the virtual reality headsets in their possession for a week, during which they were allowed to view more classrooms, as well as their own, as many times as they desired.

Role of the Researcher

In this action research study, I acted as a facilitator and as a practitioner during the VRPT exercise. A facilitator is defined as someone who designs and creates VRPT experiences for participants and helps them understand the learning process as intended for this study. I asked participants to complete IRI pre-training and post-training, conduct semi-structured interviews, and lead a focus group discussion.

In action research, bias can occur intentionally or unintentionally. Bias can cause false conclusions and may potentially mislead researcher and participants. In order to reduce or minimize potential bias, I made a concerted effort to reduce any personal bias that may influence data collection, data analysis and data interpretation processes. Reflexivity was a characteristic of

qualitative research that compelled me to reflect on my role in the study, in the context of my role as a middle school teacher and how my experiences, background, and bias might have influenced the other members and process of the study (Creswell, 2014). During data collection, I sought help from a nonparticipating faculty at Henry & Isabelle School to determine appropriate participants for this study to reduce sampling bias (Mertler, 2019). During data analysis, I deployed systematic methods for coding and utilized member checking to allow participants to review the accuracy of codes and themes. During data interpretation, I consistently reflected on how my values may be influencing my conduct as a researcher, practitioner and facilitator of the treatment.

Participants

Purposeful qualitative sampling involves the researcher in an intentional effort to understand the central phenomenon (Creswell, 2008). The intent of this research design was to understand to what degree VRPT could generate concepts related to empathy development within the context of Henry & Isabelle School teachers. I elicited feedback from Dr. Tina James, Director of Center for Study of Children, to choose participants. As part of a professional development, teachers at Henry & Isabelle School may conduct an action research study under the guidance of Dr. James. She has a list of teachers who completed this professional development along with a list of their research interest. The selected participants completed at least one cycle of action research on aspects of relational teaching. I asked participation from two teachers from lower school, two teachers from middle school and two teachers from upper school, who have completed an action research cycle or multiple cycles under her guidance. Once selected, I assigned each participant with an alias to protect his or her confidentiality. All

participants are full-time employees of Henry & Isabelle School. To build anonymity, I also used a pseudonym for the school's name: Henry & Isabelle School.

The research was undertaken with six teachers from Henry & Isabelle School, which is a private, all boys' school located in Richmond, Virginia. I invited six teachers to participate in the study and all six participants consented to the terms of agreement approved by William & Mary's Institutional Review Board. Emily, Sarah, Abby, Barbara, Michael, and Hugo were selected to be part of this study because they have prior action research experience, in terms of participating in interviews and focus groups and they have demonstrated research interest in relational teaching. Pseudonyms were used for all teacher participants in an attempt to provide anonymity, but with the understanding that in such a small sample it is likely that participants will be recognizable to their peers. Participant information is organized in Table 1.

Table 1

Participant Information

Pseudonym	Years Teaching	Subjects	Grade	VR Experience
Emily	23	Reading/Language Arts	5	None
Sarah	22	Spanish, French	5	None
Abby	9	Math, Social Studies	12	None
Barbara	31	Music, Band	8	Once or twice
Michael	28	English	7	None
Hugo	5	AP Organic Chemistry	12	None

Note. VR = virtual reality

Design Features of VRPT as Applied in the Study

There were six different VRPT videos created for this study. The teachers were asked to select one student from their classroom, to whom they would like to embody. All students and teachers were asked to carry on classroom activities as close to their normal activities as possible. A 360-degree camera lens was positioned directly in front of the chosen student on a tripod, to gain perspective of the classroom from the student's eye-level. The lower school teachers took the perspective of a lower school student. The middle school teachers took the perspective of a middle school student. And the upper school teachers took the perspective of an upper school student.

The experience began with a brief video prompting the viewer to mimic the movements of the character in the film as closely as possible. Each experience began with a student sitting in front of a desk by himself. The student began to move his arms slowly, and the participant was asked to mimic the student's hand gestures in a repeated pattern giving the participants ample opportunity to embody the character (Bertrand et al., 2018). Figure 2 illustrates the teacher's real world, versus the virtual reality seen through the headset.

Figure 2

Reality Versus Teacher's Virtual Reality



Notes. Teacher mimicking student's hand movements (left) versus teacher's viewpoint through VR (right).

Next, the viewer experienced a lecture in a classroom as a student. Each participant's actual classroom lecture was recorded, and a 3-minute segment of the lecture was part of the experience (Figure 3). In the next scene, participant experienced a 3-minute segment of a one-to-one conversation between the student and the teacher in the classroom. The teacher continued to follow the gestures created by the student to promote visuomotor and visuotactile synchronicity (Bertrand et al., 2018). Lastly, participants experienced a 3-minute small group activity in the classroom. All videos were viewed through the Oculus Go headset. The total length of each video was approximately 10 minutes. Each participant experienced their classroom environment first, then chose two other classrooms to experience within a 1-week period. All six videos were uploaded to each Oculus Go headset, thereby, providing each participant with the ability to choose which classroom to watch.

Figure 3

Viewer Taking Student's Perspective Through VR



Notes. Equirectangular, 360-degree video of lecture.

All scenes were recorded using an Insta360 Beta 4K camera. The camera was set to record 360-degree field of view at a 4K resolution. The camera was set on a tripod at the eye level of the student to achieve first-person perspective and to provide image stabilization. The camera recorded stereoscopic sounds using an external microphone, which improved immersion for the user (Martín-Gutiérrez et al., 2016). The videos and sounds were stitched and synced using Insta360 Studio software. The stitched, 360-degree clips were combined and edited using PowerDirector software. Students' conversations were typed and embedded into the 360-degree video. All VRPT experiences were viewed through Oculus Go headsets, which is a virtual reality, head mount display.

Data Sources

A letter of invitation was sent to the participants eliciting participation in the research study, which included the consent form and the application for the participant (Appendix A).

Data collection methods focused on thoughts and perceptions of various educators. There were three primary sources in this mixed-method study: (a) an adapted form of Interpersonal Reactivity Index was used to measure teachers' cognitive empathy pre- and post-treatment (Appendix B); (b) transcripts of responses to semi-structured interview questions (Appendix C) regarding the participant's experiences while involved in VRPT training; (c) focus groups (Appendix E) to share and compare VRPT experiences and subsequent effect on teaching practices and teacher-student interactions. Upon completion of the data collection, I triangulated findings from semi-structured interviews and focus group discussions to improve validity and reliability of data.

Interpersonal Reactivity Index (IRI). IRI is a 28-item scale that consists of four different 7-item subscales, representing different elements of interpersonal sensitivity (M. Davis, 1983). Empathic Concern measures people's other-oriented feelings of sympathy for the misfortunes of others and, as such, is a more emotional component of empathy. Empathic Concern scale demonstrates standardized alpha coefficients of .68 for males and .73 for females (M. Davis, 1980). Perspective-Taking is a more cognitive or intellectual component, measuring people's tendencies to imagine other people's points of view. The Perspective-Taking scale demonstrates a standardized alpha coefficients of .71 for males and .75 for females (M. Davis, 1980). The Fantasy subscale measures people's tendencies to identify imaginatively with fictional characters in books or in movies. Fantasy scale demonstrates standardized alpha coefficients of .78 for males and .79 for females. Personal Distress measures more self-oriented feelings of distress during others' misfortunes. Personal Distress scale demonstrates a standardized alpha coefficients of .77 for males and .75 for females (M. Davis, 1980). IRI used in this study was adapted to reflect a school context. For example, in place of "other guy's point

of view,” the IRI used in this study stated, “a student’s point of view.” The adapted IRI is located on Appendix B and was used to answer Research Question 1.

Semi-Structured Interviews. For this study, I administered semi-structured interviews individually with each participant allowing the participants to describe and reflect on their experiences working with students in their context. To address Research Question 2, a semi-structured interview derived questions from works of Creswell (2014), Goodwin and Hein (2017), McAllister and Irvine (2002), Stronge (2018), Theelen et al. (2019), and Walshe and Driver (2019) to understand how teacher’s belief in teacher student interaction and their teaching practices were affected by VRPT training. Interview questions to address Research Question 2 are located in Table 2.

Table 2

Semi-Structured Interview Questions Addressing Research Question 2

Construct	Interview Question	Research Basis
Role of empathy in teaching	1. How would you describe the role of empathy in your work with students?	Creswell (2014)
Personal experience with VRPT	2. Could you please describe what you saw and experienced during the virtual reality experience?	Goodwin & Hein (2017)
Reflection on teacher-student interaction	3. Keeping the student’s perspective in mind, what did you notice about the way the teacher interacted with you as the student? What are some ways that a teacher might adjust their interaction with students?	McAllister & Irvine (2002) Stronge (2018)
Reflection on teaching practice	4. What did you notice about how the teacher taught the class? How might a teacher adjust their teaching practice after seeing the world through the students’ perspectives	Theelen et al. (2019) Walshe & Driver (2019)
Changes to cognitive empathy	5. After VRPT, how might you describe changes to your level of understanding how students think and feel in the classroom?	

Note. VRPT = Virtual Reality Perspective Taking

To address Research Question 3, a semi-structured interview derived questions from works of Creswell (2014), McAllister and Irvine (2002), Stronge (2018), Theelen et al. (2019), and Walshe and Driver (2019) to understand teacher’s perceptions of the efficacy of virtual reality perspective taking as a means of professional development. Interview questions to answer research question three are located in Table 3. The interview protocol is located in Appendix C

Table 3

Semi-Structured Interview Questions Addressing Research Question 3

Construct	Interview Question	Research Basis
VRPT as a professional development tool	1. Okay, now let’s shift our focus to virtual reality perspective taking as a professional development tool. Have you received professional training on empathy in the past? What did you think about the overall quality of the training?	
Perspective taking and reflection	2. How did taking the student’s perspective in virtual reality support you to reflect on your own practice? How (if at all) do you think VRPT will affect your interaction with students or teaching practice going forward?	Creswell (2014) McAllister & Irvine (2002)
VRPT vs. ‘normal’ video	3. How (if at all) do you think using VRPT was different from using ‘normal’ video? Do you think experiencing the reality of a student from their perspective added value to your current practice?	Stronge (2018) Theelen et al. (2019)
Negative aspects of VRPT	4. Was there anything about using VRPT that you did not find helpful or wish could be added to improve its effectiveness for improving empathy or teaching practice?	Walshe & Driver (2019)
VRPT as a professional development tool	5. Would you recommend this process to your peers? Why/why not?	

Panel Review of Interview Questions. A brief field test was conducted with Henry & Isabelle School teachers, all of whom did not participate in the study. This field test was employed to determine any necessary improvements to the interview questions in order to

demonstrate the validity and reliability of the study's instruments. The study was described in an email request to colleagues, referenced in Appendix D. In addition to the field test, I submitted the interview protocol to a panel of experts to review the items and provide recommendations for improving the protocol. After consulting with the experts, the lists below are the revised interview questions for Research Question 2 and 3.

Revised Semi-Structured Interview Questions for RQ2:

1. How would you describe the role of empathy in your work with students?
2. How would you describe the role of empathy in your work with students?
3. Could you please describe what you saw and experienced during the virtual reality experience?
4. For a moment, imagine you're a student. What did you notice about the way the teacher interacted with you? If you were a student, how would you like to interact with the teacher?
5. What did you notice about how the teacher taught the lesson? Let's imagine that you are a student in your classroom, what are some things that a teacher can implement to help you learn the lesson you saw?
6. After VRPT, how might you describe changes to your level of understanding how students think and feel in the classroom?

Revised Semi-Structured Interview Questions for RQ3:

1. Okay, now let's shift our focus to virtual reality perspective taking as a professional development tool. Have you received professional training on empathy in the past? What did you think about the overall quality of the training?

2. How did taking the student's perspective in virtual reality support you to reflect on your own practice? How (if at all) do you think VRPT will affect your interaction with students or teaching practice going forward?
3. Now, let's put our teacher hat back on. How (if at all) do you think using VR was different from watching a 'normal' video? Tell me how this experience might add value to your current practice in your classroom?
4. What were some things about this process that you did not find helpful or particularly enjoyable in your experience?
5. What are some things that can be added to improve its effectiveness for improving empathy? Or teaching practice?
6. Would you recommend this process to your peers? Why/why not?

Focus Group Discussion. A focus group discussion was utilized to obtain teacher perceptions on a defined area of interest in a nonthreatening environment (Krueger & Casey, 2000). In this study, the focus group was comprised of six teachers and a researcher. Focus group discussion was intended to serve two purposes: To allow teachers to share and compare their experiences with VRPT and their application of this training, in terms of their teacher-student interactions and instructional practices and to reflect on the usefulness of VRPT as a professional learning tool for teachers at Henry & Isabelle School. Focus group protocol and questions are in Appendix E. To generate specific questions to be asked during focus group discussion, I coded interview data for themes related to empathy's role in teacher-student interaction and teaching practices. I also coded for themes related to VRPT as professional development tool. I began the focus group conversation with specific questions generated from interview data. I also asked questions to understand how interviews may have helped teachers reflect on empathic practices.

After generating specific questions for the focus group discussion, these questions were reviewed by an expert panel to improve accuracy and reliability of measurement. I consulted with two experts in the field of virtual reality, one expert in teaching and one expert in action research to revise the focus group questions generated from coding interview data. After approval from the expert panel, I finalized the focus group protocol and questions (Appendix E) and scheduled the discussion for all participants in the study through Zoom. After consulting with the experts, the lists below organizes the revised focus group questions for Research Question 2 and 3.

Revised Focus Group Questions Which Address RQ 2:

1. What were some of your general impressions of using VR to view your classroom as a student?
2. One theme that was especially consistent throughout the 1 on 1 interviews was this idea of embodied reflection. Every participant said that they were able to experience various aspects of the classroom as a student. Could you please tell me how seeing and feeling the classroom as a student might impact the way you interact with students?
3. Along the same vein, how might this experience impact the way you might prepare and deliver a lesson?
4. Another theme that emerged from the interviews was a desire to collaborate with other teachers using this technology. Could you tell the group how this training might encourage collaboration among teachers?
5. More specifically, how might collaborating with other teachers, after the training, impact the way you might interact with a student? I'm asking specifically about teacher-student interactions with this question.

6. How might collaborating with other teachers, after the training, impact the way you might prepare and deliver a lesson? So here, I'm asking more specifically about your teaching practices.

Revised Focus Group Questions Which Address RQ 3

1. Now in terms of this training as a professional development tool, what did you think about the overall usefulness of VRPT, in terms of empathizing with students?
2. As teachers, we come to the classroom with our own subjective points of view, prejudices, biases, and personal experiences, all of which inform our approach to instructional planning and instructional delivery. In what ways (if any) did you notice a misalignment between your perceptions of the classroom or students with real needs of students? Again, a reminder that everything you say here will be confidential.
3. What is your experience with the technical aspect of VR? (Comfort of headset, quality of video or sound...etc.)? Which part worked well and which part needed improvement?
4. I would like to know your thoughts about the content of the video. You experienced a variety of scenes, such as 1-on-1 lessons, small group lessons, lectures etc.,. Which content helped you the most, in terms of reflecting about your interactions with students and the way you prepare and deliver a lesson?
5. Lastly, how (if at all) do you think this experience will affect your work with students going forward?

Data Collection

Areas of focus in the context of this research study included teachers' cognitive empathy, teacher-student interactions, teaching practices and VRPT as professional development. Data were collected from February through November of 2020.

IRI. Participants completed IRI before and after treatment. I emailed the IRI survey (Appendix B) to each participant. Results from IRI survey served to provide evidence for changes in teachers' cognitive empathy after experiencing VRPT.

Semi-Structured Interviews. Semi-structured interviews were administered immediately following IRI survey on the day of VRPT training. Each interview was conducted using the same interview protocol and interview questions for all participants (Appendix C) to improve reliability between data sets. Interview questions were emailed prior to face-to-face interviews to allow participants ample opportunity to prepare their answers before the interview. Conversations between researcher and participants were voice recorded. In total, six semi-structured interviews were conducted, transcribed and analyzed. To enhance the accuracy of the findings from the interview responses, a member checking strategy was employed. All participants were provided with the opportunity to review the transcript, analyses, and final reports resulting from the action research process (Mills, 2011).

Focus Group Discussion. I acted as a facilitator and made arrangements for all participants to meet for the discussion. All six participants participated in the focus group discussion one month after treatment. I stayed open for subtopics to develop; however, conversations were centered on the focus group protocol (Appendix E) to collect data relevant to the research questions. Participants shared and compared their experiences within VRPT training and the application of this training on instructional practice and teacher-student interactions. The focus group discussion was voice recorded with permission granted by the participants. Focus group guide is located in Appendix E.

Data Analysis

Action Research Question 1. Quantitative data was collected and analyzed to answer the first research question, “To what degree does teachers’ empathy toward students change after receiving VRPT training focused on empathy building?” I examined changes to Interpersonal Reactivity Index (IRI) subscale scores before and after the two conditions. The IRI measures individual differences in empathy by assessing the participant’s tendency to adopt the point of view of others (M. Davis, 1983). The analysis reported on the descriptive statistics that were observed using this measurement. The means and standard deviations for scores on the pre-test, and post-test for both conditions were presented in a graph as part of the analysis. Participants were able to score the highest possible score: 112 points, on the IRI scale pre-treatment. Regardless of IRI result, all participants who initially agreed to participate in the study remained in the study as part of the study design.

Action Research Question 2. Data from semi-structured interviews and the focus group discussion were collected, transcribed and analyzed to inform the question, “What are teachers’ perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?” I used an inductive analysis of collected data for analyzing the responses (Mertler, 2019). First step to inductive analysis was a process where collected data in the form of interview transcripts and a focus group transcript were used to develop categories of organization, referred as a coding scheme (Mertler, 2019). I searched for words or phrases that began to repeat themselves across all forms of data measurements, then created tags to code repeated words or phrases in an online software, highlighting texts with different colors. Descriptive coding and In vivo coding were used as coding methods for the first cycle of coding

(Saldaña, 2016). Descriptive coding and In vivo coding were appropriate coding methods for qualitative data. In addition, In vivo coding method is particularly useful in educational ethnographies (Saldaña, 2016). After coding the transcription using different colors, I reread the data five more times to check for coder drift.

The second step in the process of inductive analysis was axial coding. In this stage, I began to connect data as it related to the three research questions for this study. Additionally, I compiled derived codes to categories and labelled them with overarching themes that encapsulated codes into themes (Saldaña, 2016). I deployed member checking strategy to validate compiled codes and themes from interviews and the focus group discussion (Creswell, 2008). Triangulation of information among the three sources of data added to the reliability of data interpretation (Creswell, 2008). Themes are presented in narrative form to the participants. (Mertler, 2019).

Action Research Question 3. Semi-structured interviews and focus group discussion served to inform the question, “What are teachers’ perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?” The first step to inductive analysis was a process where collected data in the form of interview transcripts and focus group transcripts were used to develop categories of organization, referred as a coding scheme (Mertler, 2019). The semi-structured interviews and a focus group discussion went through first cycle of coding using Saldaña’s (2016) descriptive coding and in vivo coding. A second cycle of coding required axial coding (Saldaña, 2016). After coding the transcription, I reread the data five more times to check for coder drift. To improve accuracy, I deployed member checking strategy to validate compiled codes and themes from interviews and the focus group discussion (Creswell, 2008). Themes are

presented in a narrative form in the data analysis (Mertler, 2019). Table 4 provides a summary of the research questions, data sources, and analysis of data.

Table 4

Research Questions, Sources of Data, Data Analysis

Research Question	Data Sources	Data Analysis
1. To what degree does teachers’ empathy toward students change after receiving VRPT training focused on empathy building?	Interpersonal Reactivity Index (IRI)	Descriptive Analysis
2. What are teachers’ perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?	Semi-Structured interviews Focus group discussion	Qualitative coding and analysis
3. What are teachers’ perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?		

Table 5 provides a description of sequence of activities for this study.

Table 5

Description of Sequence of Activities

Activities	Sequence
Create VRPT for elementary school teachers, middle school teachers, and high school teachers	January-February 2020
Teacher-reflection using IRI	February 2020, October 2020
Teachers experience VRPT	November 2020
Teacher-reflection using IRI	November 2020
Interviews following VRPT using Appendix C	November 2020
Focus group discussion using Appendix E	December 2020

Note. VRPT = Virtual Reality Perspective Taking; IRI = Interpersonal Reactivity Index

Assumptions, Delimitations, and Limitations

Assumptions. Many of my assumptions may have biased the research process, as I perceived the perspective-taking activities engaged by Henry & Isabelle School teachers as automatically leading to increase of empathy, rather than examining the influence of these activities objectively, through the perspectives of the participants. I was aware of my assumption that all Henry & Isabelle School teachers will have an interest in their own participation and in the outcomes of their empathy training. I assumed the honesty and integrity of the participants' disclosures in their interviews.

Delimitations. The delimitations and limitations for this action research study were related to my choice of methodology. The potential for bias in qualitative research was significant. Researcher bias may influence direction, process, and interpretation of data, leading to inaccurate results. Another delimitation was my choice of action research as the study's methodology. By choosing action research, I delimited this study to the small set of teachers at Henry & Isabelle School, who served as participants of this study.

Limitations. Although the design of researcher-as-participant was an advantage of action research to find solutions where it matters, my role as researcher was complex. The "practitioner" advocated for change in empathy, while the "researcher" strived to remain objectivity while conducting an inductive study process. There were several limitations to this project. First, this was a locally developed, small study both in timescale and participant size. Further research is needed to explore the impact of VRPT on a large group of teachers and over a longer period of time. Second, due to the nature of action research, causality and generalizability of the findings were significantly restricted.

Ethical Considerations

As this action research study involved collection and analysis of perceptions and feelings of teachers, a profound ethical consideration and protective measures were implemented during planning stage, acting stage, developing stage and communicating and reflecting stage of action research (Mertler, 2019). Research findings from this study were shared with the participants involved in the study. Therefore, permission to participate in the study was asked for and granted by all who participated. Results will be shared publicly, therefore, the identity of the school, as well as, the identity of the participants are anonymized. I provided every participant with an informed consent form (Appendix A), which will clearly outlined the action research design and provided an opportunity for the participant to withdraw his or her involvement from the study. The informed consent guaranteed anonymity of participants (Mertler, 2019). I sought approval to conduct this study from the College of William & Mary's Institutional Review Board (IRB) and Henry & Isabelle School.

CHAPTER 4

FINDINGS

The purpose of this mixed-methods action research study was to explore the effect of virtual reality perspective taking (VRPT) on teachers' cognitive empathy. Additional goals included examining how teachers' beliefs about teacher-student interactions and teaching practices were affected by VRPT. Lastly, the study was designed to understand teachers' perceptions regarding the efficacy of virtual reality as a viable, professional development tool. Additionally, unintended outcomes revealed themselves in the study. The central research questions that served to guide this study include the following.

1. To what degree does teachers' empathy toward students change after receiving VRPT training focused on empathy building?
2. What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?
3. What are teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?

The measurement instruments employed to inform the action research questions included the Interpersonal Reactivity Index survey, semi-structured interviews, and a focus group discussion. The analysis of qualitative data included multiple coding methods as prescribed by Saldana (2016). Inductive analysis involves reducing and systematically organizing data in ways that foster the understanding of data sets, categories, themes, and theories (Saldaña, 2016).

Action Research Question 1

To what degree does teachers' empathy toward students change after receiving VRPT training focused on empathy building?

Interpersonal Reactivity Index (IRI).

The IRI survey is a 28-item scale that consists of four different 7-item subscales, representing different elements of interpersonal sensitivity (M. Davis, 1983). For each item on the survey, zero is the lowest score and four is the highest score. The highest score a participant can produce is 112 and the lowest score a teacher can produce is 0. The total mean score from the pre-test yielded 77.5 with a standard deviation of 5.82 and the mean score for the post-test yielded 81 with a standard deviation of 6.23. The mean difference between pre-test and post-test was an increase of 3.5. Table 6 organizes individual IRI scores from each participant and means and standard deviations for all participants.

Table 6

Mean Scores and Standard Deviations from IRI for Research Question 1

Pseudonym	Pre-VRPT Score	Post-VRPT Score	Pre-Post IRI Score Difference
Barbara	71	77	+6
Michael	77	76	-1
Abby	87	82	-5
Sarah	78	91	+13
Hugo	80	85	+5
Emily	72	75	+3

Note. Highest possible score on Interpersonal Reactivity Index is 112 and the lowest possible score on IRI is 0.

Table 7 compares the overall mean difference from all participants on the IRI and the standard deviations.

Table 7

Overall Mean Difference and Standard Deviations from IRI for Research Question 1

	Pre-VRPT <i>M</i>	<i>SD</i>	Post-VRPT <i>M</i>	<i>SD</i>	Overall Change
All participants	77.5	5.82	81.00	6.23	+3.5

Note. IRI = Interpersonal Reactivity Index. VRPT = Virtual Reality Perspective Taking. Highest possible score on IRI is 112 and the lowest possible score on IRI is 0.

The original research design requested participants to complete the pre-test survey in February of 2020. Then, the plan was to conduct the experimental treatment with every participant in March of 2020, followed by the post-test survey. In March 2020 all faculty members of Henry & Isabelle School received communication from the head of school that the school will abide by the state-wide, mandatory shut down of all Virginia schools due to the Corona virus pandemic. Henry & Isabelle School closed from March of 2020 through June of 2020. During the summer vacation of 2020, I emailed all participants that we will resume with the research study when we return to school for on-campus instruction. All staff and faculty members returned for on-campus instruction in September of 2020. Four participants completed the pre-test survey in February of 2020 and the remaining two participants completed the pre-test survey in October of 2020. I conducted the VRPT experiment in November of 2020 and all participants completed the post-test survey in November of 2020. I recognize that not all participants completed the pre-test survey at the same time, which may influence post-test survey data. To see if there was a substantial difference in IRI scores between the participants who completed the pre-test survey in February 2020 versus October 2020, I calculated mean differences between the two groups. Regarding the pre-test, there was only a minimal difference (+1.5) from the mean IRI score of participants who completed the pre-test survey in February of 2020 to the mean IRI score of participants who completed the pre-test survey in October of 2020. Regarding the post-test, there was a minimal difference from (-0.75) the February group to the

October group. The highest possible score a teacher can produce on the IRI is 112 and the lowest possible score a teacher can produce is 0. The small differences between the two groups likely mean that the two different, pre-test dates had minimal effect on the post-test data. Table 8 shows changes in mean differences between the two groups.

Table 8

Difference of Mean Comparison Between Participants Who Completed the Pre-Test Survey in February of 2020 Versus October of 2020

Group	Pre-VRPT		Post-VRPT	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
February	77.00	7.35	81.25	2.12
October	78.50	7.14	80.50	6.36
<i>M</i> difference	+1.5		-0.75	

Note. Interpersonal Reactivity Index. VRPT = Virtual Reality Perspective Taking. Highest possible score on IRI is 112 and the lowest possible score on IRI is 0.

Table 9 provides an item-by-item analysis of the means, standard deviations, and mean differences for all items on the IRI survey. Although there is not a dramatic difference between the pre- and post-test data, all subcategories of the IRI survey, namely perspective taking, empathic concern, personal distress and fantasy, show positive mean differences between pre-test and post-test.

Table 9

Item by Item Mean Scores and Standard Deviations from Revised IRI for Research Question 1

Item	Pre-VRPT		Post-VRPT		<i>M</i> Difference
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>Perspective Taking</i>					
I sometimes find it difficult to see things from the students' point of view.	3.00	0.89	3.17	0.75	+0.17
I try to look at students' sides of a disagreement before I make a decision.	3.00	0.63	3.33	0.82	+0.33

I sometimes try to understand my students better by imagining how things look from their perspective.	2.67	1.03	3.17	0.41	+0.50
If I'm sure I'm right about something, I don't waste much time listening to students' arguments.	2.67	1.03	2.33	1.63	-0.34
I believe that there are two sides to every question and try to look at them both.	3.00	0.63	3.50	0.55	+0.50
When I'm upset at a student, I usually try to "put myself in his shoes" for a while.	2.83	0.75	2.50	1.05	-0.33
Before criticizing a student, I try to imagine how I would feel if I were in their place.	2.67	1.03	3.00	0.63	+0.33
When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me.	3.17	0.75	2.67	1.03	-0.50
<i>Empathic Concern</i>					
I often have tender, concerned feelings for students less fortunate than me.	3.50	0.55	3.67	0.52	+0.17
Sometimes I don't feel very sorry for students when they are having problems.	3.33	0.82	3.33	0.82	0.00
When I see a student being taken advantage of, I feel kind of protective towards them.	3.83	0.41	3.50	0.55	-0.33
Students' misfortunes do not usually disturb me a great deal.	3.50	0.84	3.83	0.41	+0.33
When I see students being treated unfairly, I sometimes don't feel very much pity for them.	3.50	1.22	3.50	0.55	0.00
I am often quite touched by things that I see happen.	3.50	0.55	3.67	0.52	+0.17
I would describe myself as a pretty soft-hearted person.	3.33	0.52	3.50	0.55	+0.17
<i>Personal Distress</i>					
In emergency situations, I feel apprehensive and ill-at-ease.	2.67	1.21	2.50	1.64	-0.17
I sometimes feel helpless when I am in the middle of a very emotional situation.	2.33	1.51	2.33	0.82	0.00
When I see a student get hurt, I tend to remain calm.	1.67	0.82	1.50	1.38	-0.17
Being in a tense emotional situation scares me.	2.33	1.21	2.67	1.51	+0.34
I am usually pretty effective in dealing with emergencies.	1.33	1.21	1.50	1.52	+0.17
I tend to lose control during emergencies.	1.33	1.21	1.83	1.47	+0.50
When I see someone who badly needs help in an emergency, I go to pieces.	1.33	1.21	1.17	1.17	-0.16
<i>Fantasy</i>					
I daydream and fantasize, with some regularity, about things that might happen to me.	1.83	1.17	2.83	1.47	+1.00
I really get involved with the feelings of the characters in a novel.	3.33	0.52	3.67	0.52	+0.34

I am usually objective when I watch a movie or play, and I don't often get completely caught up in it.	2.50	1.22	3.17	0.75	+0.67
Becoming extremely involved in a good book or movie is somewhat rare for me.	3.83	0.41	3.50	0.84	-0.33
After seeing a play or movie, I have felt as though I were one of the characters.	2.50	0.55	2.67	0.52	+0.17
When I watch a good movie, I can very easily put myself in the place of a leading character.	3.00	0.63	3.00	0.63	0.00
When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me.	3.17	0.75	2.67	1.03	-0.50

Note. 4 = highest possible score per item, 0 = lowest possible score per item

Table 10 shows the mean differences for each category on the IRI.

Table 10

Mean Differences for Each Category on the IRI

	Perspective Taking	Empathic concern	Personal distress	Fantasy
Mean differences	+0.66	+0.51	+0.51	+1.35

Summary of Findings for Research Question 1

I was unable to compute statistical differences given the small (N=6) sample size. Nonetheless, the descriptive findings do suggest particular patterns. IRI scores from four out of six participants increased from pre-VRPT to post-VRPT. The greatest change resulted from Sarah's IRI score, from 78 to 91, which is an increase of 13 points. Overall, there was an increase of 3.5 points from pre-VRPT to post-VRPT. When analyzing categories within the IRI survey, there was a minimal, positive change from pre- to post- test results for three of the four categories—perspective taking increased by 0.66, empathic concern increased by 0.51, personal distress increased by 0.51 on a 5-point scale. There was a substantial increase of 1.35 for fantasy on a 5-point scale.

Action Research Question 2

What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building?

VRPT training for Henry & Isabelle School teachers engaged in experiencing the virtual reality perspective taking occurred over the course of 1 week. Participants were asked to keep the VR devices in their possession during the week of treatment and view themselves at least once. They were also instructed to view two other classrooms during the week of treatment. A week after teachers' VRPT experience, interviews were conducted individually to understand teachers' perceptions about their ability to understand how students may see and feel in their classroom and how those perceptions may or may not impact their classroom interactions with students and their teaching practice. Interviews and focus group discussions yielded 142 data responses. Forty-two (29.5%) of 142 data responses focused on physicality, more specifically spatial reflection, movement, and voice pitch and volume of teachers and students. Forty-eight (33.8%) of 142 responses focused on engagement, more specifically, student engagement toward the teacher, student engagement toward the curriculum, and teacher misperceptions of student engagement in the classroom. Sixteen (11%) of 142 data responses focused on teachers' efficacy towards VRPT as a professional development tool. Fourteen (10%) of 142 data responses focused on teachers' perception of effective teachers and 22 (15%) of 142 responses focused on teacher suggestions for future implementation of the research study at Henry & Isabelle School. Table 11 organizes the set of categories emerging from the data, along with examples from each category.

Table 11*How Empathy Affects Teacher-Student Interactions After Experiencing VRPT*

<i>Theme</i> Frequency/%	Category	Frequency/ %	Excerpts
<i>Physicality</i> 42 of 142 30%	Spatial reflection	15 of 42 36%	“I can also see these videos being really helpful, maybe for new teachers, even as they're considering space, and they're considering classroom arrangement, and different ways to create learning spaces. The video made me think, how can I create effective learning spaces for the boys to be able to have space to relate and interact with each other, as well as the person who is providing instruction?” (Emily)
	Movement	17 of 42 40%	“I noticed students just sitting. I think that was something that stuck out to me, just the passive nature of sitting and consuming information.” (Hugo)
	Voice pitch and volume	10 of 42 24%	“I spoke with force at times, trying to project my voice. I was trying to keep their attention.” (Hugo)
<i>Student Engagement</i> 48 of 142 34%	Student engagement toward the teacher	25 of 48 52%	“I did not attend as well, I thought, to my introverted students. I was engaging more with the extroverted students. My quieter, more introverted students were actually making interesting comments and ideas that I missed.” (Abby)
	Student engagement toward the curriculum	11 of 48 23%	“The clip I showed was a clip by Thomas Edison of a Yale-Princeton football game, and it went along with a Charles Ives piece. To me, that’s interesting, but they actually weren’t interested in it, even though boys in the past had been interested in it.” (Barbara)
	Teacher misperceptions of student engagement	12 of 48 25%	“I have a student who is a very bright young man, but he would typically use that knowledge to take conversations in a sideways fashion in the classroom. What I witnessed in your video, when he was working with a classmate, they were actually very much on task, and challenging each

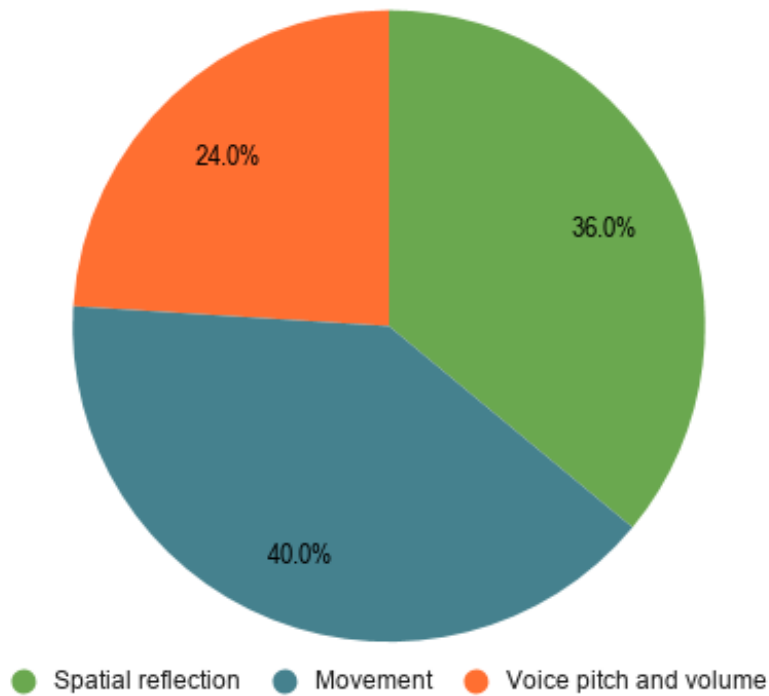
other, and pushing each other academically.”
(Emily)

Note. VRPT = Virtual Reality Perspective Taking

Figure 4 illustrates the distribution of responses to the theme of physicality.

Figure 4

Emergent Categories Within the Theme of Physicality

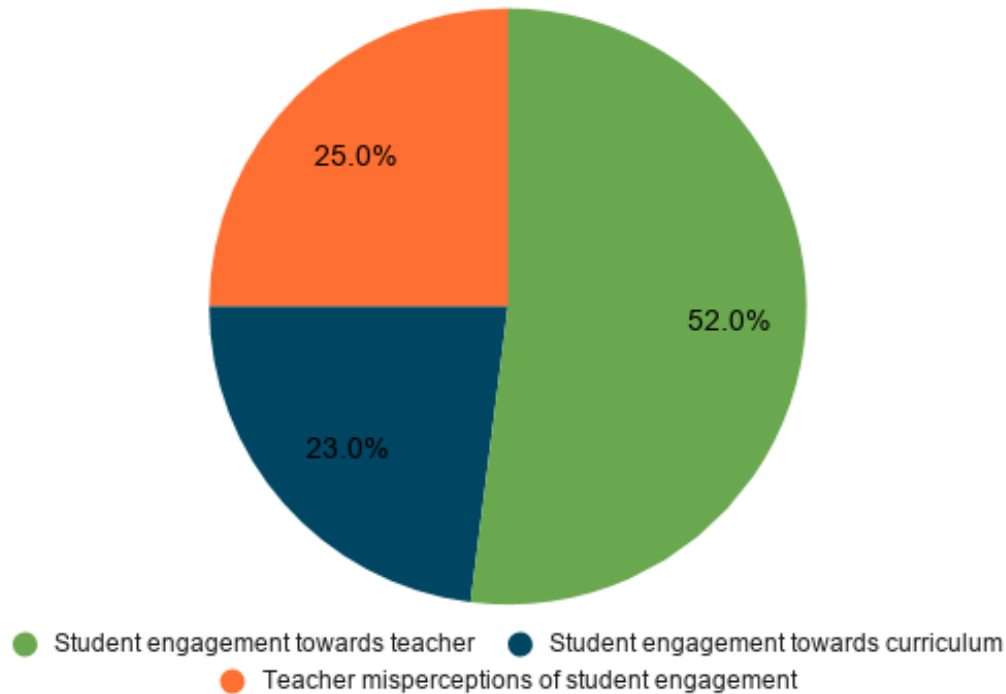


Notes. Chart categories emerged from the data regarding how empathizing with a student might impact teacher-student interactions after experiencing virtual reality perspective taking.

Figure 5 illustrates the distribution of responses to the theme of student engagement.

Figure 5

Emergent Categories Within the Theme of Student Engagement



Notes. Chart categories emerged from the data regarding how empathizing with students might impact teacher-student interactions after experiencing virtual reality perspective taking.

Semi-Structured Interviews

Semi-Structured interviews incorporated 40-minute conversations with each participant to inform participants responses regarding their current level of empathy, their current practices as it relates to empathy, and their perceptions of VRPT effectiveness. Interview questions are located in Appendix C.

Focus Group Discussion

A focus group discussion allowed teachers to share and compare their experiences with VRPT and their application of this training, in terms of their teacher-student interactions and instructional practices and to reflect on the efficacy of VRPT as a professional learning tool for

teachers at Henry & Isabelle School. Focus group protocol is located in Appendix E, and the focus group questions are located in Appendix E.

Responses to Interview Prompt Regarding Teacher Interaction with Students. All six participants described themselves as being able to embody the student's perspective in their classroom and reflected on the physicality of the space, namely, reflection on classroom space, movement and voice pitch and volume.

Physicality—Spatial Reflection. As noted in Table 11 and Figure 4, the theme of spatial reflection emerged regarding how empathizing with students may impact the way teachers see and design the classroom space. Fifteen (36%) of 42 of responses demonstrated an ability for teachers to reflect on their physical classroom space. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- Watching it several times also then I would start looking around more. And it made me homesick for my band room on that band rehearsal, because I was like, “Oh look, and there's him. And there's him. And there's him.” So it was kind of cool. You just kind of recreated it. I mean, it's like being in there. That's so amazing.
- That class had 18 boys in it, and that is a tight, tight space to have 18 boys. There was a group of boys on the rug, on the floor, and the big chairs. I kept looking and the desk was literally right behind them. Like, they were leaning on each other. As an adult, that would bother me, but it was clear that it did not bother them very much. I was thinking it would be more distracting to them than it appeared to be.

Physicality—Movement. As noted in Table 11 and Figure 4, the theme of movement emerged regarding how experiencing the classroom as a student may impact the way teachers notice the level of body movement throughout the classroom. Five of six participants state that

the way teachers move closer or farther from students demonstrates a level of care for students.

The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “Gosh, I'm just this woman up on a board. That's not how I perceive myself, but that is definitely who I was that day and I was kind of disappointed.”
- “I didn't move around a lot. I think in past years, if it wasn't a pandemic year, I would have moved around more. I like teachers who are more physically active, who move through the class. To me, being physically closer to students shows a certain level of care, for the teacher to come over to the student and be closer to the student.”
- “Now I'm trying to move where I am in the classroom as much as possible, and trying to make sure that those kids, who are a little quieter, more introverted, that I'm not missing the input that they have for the class.”

Physicality—Voice Pitch and Volume. As noted in Table 11 and Figure 4, the theme of voice pitch and volume emerged regarding how empathizing with students may impact the way teachers hear their own voice and the voice of students in the classroom, specifically in terms of their tone and loudness.. Four of six participants stated that the way teachers are heard by the students may or may not facilitate an effective learning environment for their students. The following teacher quotations from interviews are indicative of teacher comments for this theme:

- “I didn't realize how loud I was, how I speak, maybe in a commanding sort of way. Or in a way, I can come across as imposing because of my gestures. Even when I use my hands, I tend to make myself bigger, and again, I don't know how students respond to that. If they feel like a certain level of intimidation, I don't know, but that's how I heard myself.”

- “I realized how I need to be more attuned to my quieter students. I get too excited when I hear information, and get too wrapped up in the kids who are giving me, the louder voices in the room, and I'm missing some of my quieter voices. While I was watching the video, I said to myself ‘Oh, I missed that comment, Johnny said that and I didn’t hear it.’ It was just, it really helped to create the classroom from the student’s perspective.”
- “I’m trying to change my tone of voice. I tend to deliver very flat, kind of a flat voice. It’s brought more to my attention now, because my child has ADHD, and I keep being misunderstood. I keep telling her, ‘No, I’m not mad. I just have a flat voice, that’s just how I am.’ I’m not a cheerleader type. I just deliver the information.”

The situatedness nature of viewing 360-degree video allows users to notice engagement in the classroom more accurately than simply recalling engagement from memory (Walshe & Driver, 2019). With this research in mind, 48 (34%) of 142 of responses from interviews and focus group discussion focused on the ability of 360-video to help teachers see student engagement towards the teacher, student engagement towards curriculum, and also teacher misperceptions of student engagement in the classroom. Figure 5 illustrates the distribution of responses within the theme of engagement.

Student Engagement Towards the Teacher. As noted in Table 11 and Figure 5, the theme of student engagement towards the teacher emerged regarding how seeing the classroom as a student may allow teachers to reflect on the level of engagement between the teacher and the students. Student engagement towards the teacher, in the context of this study, can be operationally defined as the teachers’ noticing of students’ eye-contact with the teacher and students’ responsiveness to classroom discussions. Twenty-five (52%) of 48 interview and focus

group responses regarding engagement in the classroom focused on the teacher's ability to engage with their students. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “I'm an introvert, and so I was interested that in the classroom, I did not attend as well, I thought, to my introverted students. I was engaging more with the extroverted students. My quieter, more introverted students were actually making interesting comments and ideas that I missed.”
- “If we set up a 2D camera at the back of the band, it's focused on the teacher. Like you as a director, are you talking too much? Are you waving your hands? Is your left hand unclear? It's all focused on the teacher. It's not even looking at the kids, and so I think the 360 video where you could look all around you, I found it really interesting to have that full view of the students' reaction to how I'm teaching.”
- “A student had a group of four boys and me, he was teaching something to. The teacher was trying to get everyone's attention to make the transition out to recess. That small group of students were quiet and respectful, but they did not stop and look up at the teacher at that moment. Just that, just being aware of a lot of times we think that when we speak, everything needs to stop, not necessarily. The student was almost finished teaching his friends and he had a really good point.”

Student Engagement Towards the Curriculum. As noted in Table 11 and Figure 5, the theme of student engagement towards the curriculum emerged regarding how empathizing with a student may allow teachers to notice the level of engagement between the student and the curriculum. Eleven (23%) of 48 responses regarding engagement in the classroom focused on the

students' level of engagement with the curriculum. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “One group of boys was reviewing vocabulary in preparation for a quiz, so they were basically using the puzzle pieces to create their own study guide.”
- “Some of the boys were very engaged by that, and some could have cared less. Levi, he was just sitting there and he kept saying, ‘I’m so behind, I’m so behind.’ Yet, he did not push himself forward.”

Teacher Misperceptions of Student Engagement. As noted in Table 11 and Figure 5, the theme of teacher misperceptions of student engagement emerged regarding how empathizing with a student may allow teachers to challenge their perceptions of student engagement. Twelve (25%) of 48 responses regarding engagement in the classroom focused on how teachers wrongly perceived students' level of engagement with the teacher or the curriculum. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “I would spend a lot of our time together trying to refocus the student to the task at hand. In that moment in the video, he was very focused. He didn't need any reminders about his work and he, in fact, was helping refocus his classmate, which was good to see because I didn't always get to see that side of him.”
- “In one video, there were kids who were just chit chatting and carrying on. For a split second, it started to sink in. I’m like, wait a moment. Those little creepers. You know what? I allow it in my own classroom. I started thinking about when those kids are connecting with each other, are they connecting because I have missed an opportunity to connect with them and they’re searching for it elsewhere?”

- “I was amazed that the boys were not as kind to each other. They weren’t mean, but they were very comfortable. You know how it is when you’ve been with somebody for awhile, and you will say things a little more bluntly than you would if it was somebody you were not sure how they would respond.”

Responses to Interview Prompt Regarding Teaching Practices. Teacher reflection is a self-critical, exploratory process through which teachers consider the effects of their teaching practice on their situated context with the aim of improving those decisions (Tripp & Rich, 2012). Regarding participants’ perceptions about the effectiveness of VRPT on a teacher's ability to adjust their teaching practices revealed all six teachers attributed changes to their teaching practices directly to the VRPT experience. The results are demonstrated in Table 12.

Table 12

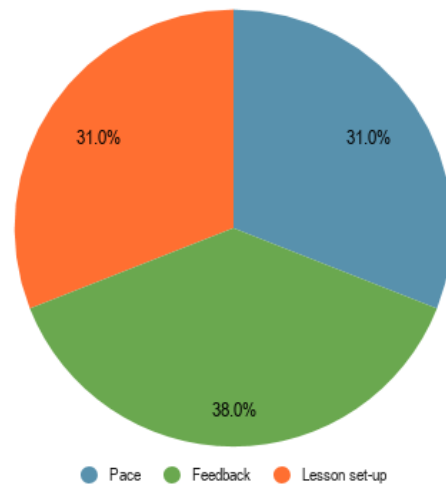
Emergent Themes Regarding How Empathy Impacts Teaching Practice After VRPT

<i>Theme</i> Frequency/%	Category	Frequency/%	Excerpts
<i>Teaching Practice</i> 16 of 142 11%	Pace	5 of 16 31%	“Just thinking about how we've done that in the past, it was good that the boys had the answer key there. I noticed a fair number of boys completing the assignment, and then comparing it to the answer key, so that they could move on at a pace that worked. When the kids are done with the activity, they're ready to move on to something else. With that particular group of boys, I recognize that pace is important to them.” (Emily)
	Teacher Feedback	6 of 16 38%	“My concern is always how much am I listening and how much am I controlling the conversation. I wanted to see if I was giving too much information when I shouldn't be, and after seeing myself on VR I thought, ‘Oh, okay. She’s doing okay.’” (Sarah)
	Lesson Set-up	5 of 16 31%	“Instead of me lecturing on the board about units, I could have the students write down as many units as they saw, different units and then researched themselves, then provide an opportunity to teach their peers.” (Hugo)

Figure 6 illustrates the distribution of responses within the theme of teaching practice.

Figure 6

Categories Within the Theme of Teaching Practices



Note. Chart categories emerged from the theme of teaching practices regarding how empathizing with students might impact teaching practices after experiencing virtual reality perspective taking.

Pace. As noted in Table 12 and Figure 6, the theme of pace emerged regarding how empathizing with a student may impact teaching pace. Walshe and Driver (2019) states “the use of 360-degree video support teachers to better understand time within the context of their microteaching” (p. 102). Five (31%) of 16 comments regarding teaching practices, focused on the participants’ reflections regarding instructional pace. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “I started thinking about the way I ask questions to kids from the kids’ perspective, and I asked for feedback from the kids. They were like, “Well, you talk kind of fast. Then, when you’re like, do you have any questions? You wait maybe 2 or 3 seconds. We need like 5 or 6.” I was like, “Oh, gosh.” I spoke to my other class and they were 100% in agreement, so I have changed how I ask questions, how long I wait after I ask a question. That’s something that just came to me as a surprise.”

- “The video was helpful because it reminded me about my student surveys. I remember my students would tell me ‘I liked working fast when I needed to work fast, but I like slowing down when I want to slow down.’”

Feedback. As noted in Table 12 and Figure 6, the theme of feedback emerged regarding how empathizing with a student may impact teachers’ approach providing feedback to students. Six (38%) of 16 comments regarding teaching practices, focused on the participants’ reflection regarding how they provide feedback to their students. Five of six participants stated either they can affirm their current teaching practice on providing feedback or they are able to provide an alternative method for feedback. The following teacher quotes from interviews are indicative of teacher comments for this theme:

- “I was comfortable listening to that feedback. I felt like it was encouraging enough, but I wasn't feeding him the answers, which is one thing I was worried about. Writing, to me, is hard. It's easy to impose your ideas of what good writing is, rather than pulling it from the student. I was worried about ... I always worry about that. How do you motivate and move a student to progress with his writing, and to develop his ideas and not give him the ideas?”
- “For me, I’ll come up to one of the quiet kids and I’ll be like, “Hey, I know it’s hard for you to raise your hand and I’m not going to ask you to do that, but if you can be active in small group activities...” That’s the empathy piece, that you’re not screwing over a kid’s grade because of who he is.”

Lesson Set-up. As noted in Table 12 and Figure 6, the theme of lesson set-up emerged regarding how empathizing with a student may impact how teachers set up their lessons. Five (31%) of 16 comments regarding teaching practices focused on the participants’ reflections on

how they might set up the lesson next time. Four of six participants stated they are able to provide an alternative set up for the lesson. The following teacher quotes from interviews and focus group discussion are indicative of teacher comments for this theme:

- “I always thought that the clip of the Yale Princeton football game was really cool, but I didn't set it up right. I just said, "And here's a clip that Thomas Edison..." and I didn't review with them who Thomas Edison was, and some of them recognize the name, but I think others didn't even realize it. Next time, I might just have them start composing by activating their prior knowledge. Just start questioning them, “How would you write the kickoff with instruments? How could you create the sound of a quarterback barking out the signals?” I think starting that way and then playing the actual clip of the game for them would be better.”
- “I go back and think, what could make the lesson better? Specifically, what could make the lesson more active? I don't know why that's such a big deal to me. But, I grew up in a classroom environment where it was terribly passive and working in a lab is very active. You're on your feet all the time. If you have a physical injury, you actually cannot work in a lab. And it's collaborative. You could be a chemist, who's working with a chemical engineer and a molecular biologist. Whatever the discipline, it's learning how to work together. Maybe we can emulate that in the classroom somehow.”

Summary of Findings for Research Question 2

The immersive experience of watching the classroom as a student appeared to impact the teacher's interaction with students in two distinct ways—reflecting on the physiological aspects of the classroom and student engagement towards teacher and curriculum. In terms of

physiological aspects of the classroom, teachers were able to reflect on physical space, teacher and student movements in the classroom, and voice tone and volume. Teachers were also able to reflect on student engagement towards their teacher and their curriculum. Data from interviews and focus group discussion also revealed a newfound ability for two teachers to challenge their extant perceptions about student engagement towards their teacher and their curriculum.

The use of VRPT experience provided teachers with the opportunity to relive their own classroom's experience, but also sought to challenge their assumptions supporting their teaching practice. Responses to interview questions and focus group discussion questions regarding teaching practices revealed three distinct ways VRPT helped teachers—pace, feedback, and lesson set-up. Improving teachers' ability to reflect on pace, feedback and lesson set-up may improve teachers' efficacy towards more effective teaching practices.

Action Research Question 3

What are teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development?

After teachers' VRPT experience and the subsequent interview, a focus group discussion took place with all six participants present to understand teachers' efficacy towards VRPT as a professional development tool. As noted in Table 16, 30 (21%) out of 142 responses from interviews and focus group discussions focused on participants' efficacy towards using VRPT as a professional development tool. Table 13 organizes the set of categories emerging from data, along with examples from each category.

Semi-Structured Interviews.

Semi-structured interviews incorporated conversations with each participant to inform participants responses regarding their perceptions regarding VRPT as a professional development tool at Henry & Isabelle School. Interview questions are located in Appendix C.

Focus Group Discussion.

A focus group discussion allowed teachers to share and compare their experiences with VRPT and their possible application of this training as a professional learning tool for teachers at Henry & Isabelle School. Focus group questions are located in Appendix E, and focus group protocol is located in Appendix E.

Table 13*Emergent Themes Regarding VRPT as a Professional Development Tool*

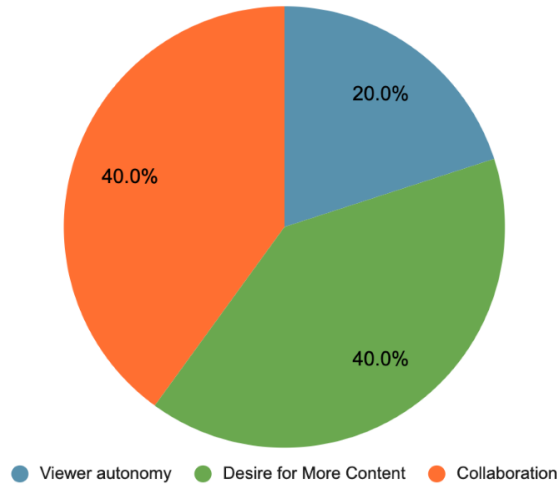
<i>Theme</i> Frequency/%	Category	Frequency /%	Excerpt
<i>Efficacy of teachers towards VRPT as professional development tool</i> 30 of 142 21%	Viewer autonomy	6 of 30 20%	The video gives us an ability to access something that we wouldn't otherwise be able to access. It even moves just beyond just filming a class with a traditional 2D video camera because we're able to see 3D. We can sit there in the seats of the students and move around, and look around. (Hugo)
	Desire for More Content	12 of 30 40%	10 minutes wasn't enough. I would have liked to see five different, 10 minute sessions of me doing different things. Leading a discussion, passing out a quiz, giving answers, doing instruction. That'd been very interesting to me to see if I had different ways to do those things, and different voices, and different body postures, and blah, blah, blah. Even in a disciplinary fashion, like me, or way of disciplining a kid who's interrupting somebody, or whatever, see how I did that. That would be interesting. (Michael)
	Collaboration	12 of 30 40%	In a lot of schools, there's one music teacher or one band director, and so I think it would be really helpful for people in those fields to get a chance to have some professional development with people who teach the same thing they do. It's just harder to get them together. (Barbara)

Note. VRPT = Virtual Reality Perspective Taking

Figure 7 illustrates the distribution of responses within the theme of VRPT as a professional learning tool.

Figure 7

Categories within the Theme of VRPT as a Professional Development Tool



Note. Chart categories emerged from the theme of teacher efficacy towards using VRPT as a professional development tool at Henry & Isabelle School. VRPT = Virtual Reality Perspective Taking

Responses to Interview Prompt Regarding VRPT as a Professional Development

Tool. All six participants described VRPT training as adding value to their ability to empathize with their students and to reflect on teacher-student interactions and teaching practices. Table 13 and Figure 7 describes the distribution of three themes that emerged from interview and focus group discussion data regarding VRPT as a professional development tool, namely viewer autonomy, desire for more content, and teacher collaboration.

Viewer Autonomy. As noted in Table 13 and Figure 7, the theme of viewer autonomy emerged regarding the efficacy of VRPT as a professional learning tool. Regarding the capacity for 360-video to allow viewers to look around, Walshe and Driver (2019) states, “it is an immersive type of video content which allows the viewer to look around in all directions, giving them choice and control over what they see.” (p. 98). With this research in mind, all participants described this ability to look around and have complete control of their perspective. The

following teacher quotes from interviews and focus group discussion are indicative of teacher comments for this theme.

- “I just thought it was cool to just look around. I was looking all around, looking up and down like, ‘This is so cool.’ And watching it several times, I would start looking around more. And it made me homesick for my band room on that band rehearsal, because I was like, ‘Oh look, and there's him. And there's him.’ The video just kind of recreated it. I mean, it's like being in there.”
- “I thought it was really, really cool to be able to look all around and see what, just even how the room looks and how things are, and that perception of the classroom experience itself.”
- “In the whole class conversation, I was looking at what was happening with the boys more than focused on what I was doing. In a small group setting, I was much more focused on what I was doing, and how I was interacting. It was interesting where my focus was given different situations.”
- “You can control what you're looking at. I can look at Bob. I can look at John. I can look at me. I can look at Bob. So you get more information than a two dimensional video.”

However, one of six members spoke to not liking the immersion aspect of VRPT.

- “I did not like it one bit. It just felt unnatural. I kept thinking about this movie where these people who were getting lost in this virtual reality world and they couldn't really snap out of it because it felt so real. I can see this experience might be interesting for somebody who might have difficulty with empathy. Maybe people like me just a camera in the corner recording would be enough.”

Desire for More Content. As noted in Table 13 and Figure 7, the theme of desiring more content emerged regarding the use of VRPT as a professional development tool at Henry & Isabelle School. The video as it is currently designed contains approximately ten minutes of footage from each participant's classroom, shot from the perspective of a student. Seven of eight participants expressed a strong interest in seeing themselves in a variety of teacher contexts and watching longer videos. The following teacher quotes from interviews and focus group discussion are indicative of teacher comments for this theme.

- “I wanted more video. I wanted to see myself handing back a test. I wanted to see myself disciplining kids in the hallway. I wanted to see myself on a playing field giving coaching instructions. I wanted to see myself giving kids a pep talk about an upcoming assessment. All of those things, I think, would've been really cool. That was just an appetizer. But I was really thinking to myself, especially as I look behind me and I look from his perspective and his perspective and looked at myself and my gestures, you know?”
- “Well, this training has given me a desire for more. Because I can't... I don't think I can confidently say after watching one video was enough to get everything that I really want. I think it's actually generated questions, and a desire to do more of this. Like, What would it look like when I'm doing a hands on activity, or what I call a guided inquiry activity or lab? What would it look like during a lab? I would like to see this film capture more of a diverse setting.”
- “Since it's been out, it's been one of those things I've wondered, why haven't we done more with it as a school? It just seems like such an amazing tool for boys to use, that

I'm like, why isn't this just like our Chromebooks, something else and just another way of seeing and experiencing the world?"

However, one of six members expressed that she does not enjoy watching herself on video.

- “Videotaping as a technique band directors have used forever and I've never done it because I don't like being on video. It's more about my body image. I hate hearing my voice on tape.”

Collaboration. As noted in Table 13 and Figure 7, the theme of collaboration emerged regarding the use of VRPT as a professional development tool. Regarding 360-video's ability to induce collaboration, Star and Strickland (2008) states 360-video provide illustrations of teaching and learning theories and provide teachers the opportunity to watch videos together and discuss their observations. The following teacher quotes from interviews and focus group discussion are indicative of teacher comments for this theme.

- “The video gave me things to compare how I was doing things in my classroom with how another teacher might be doing things in their classroom, so that was very powerful for me to look at. I would love to see Michael on a one on one, to see how he approaches that, and just think about the power of those kinds of situations for a new teacher coming in. If we could learn from each other and understand how we pull information from students in different ways.”
- “It would be interesting also if there's a student that you're struggling to find a connection with or relationship with, to be able to see them in another environment, and to help create more empathy. It's like, ‘I get it now. I understand where he's coming from.’ Because it might be that he doesn't really like my subject. He could look very different in another environment, and just the opportunity to see that so you

can have that, see the complexity of him as a whole and not see him just pegged in one way. I think it'd be really beneficial. It'd be a great way to increase relationships and empathy. Just to help you develop that, if you're trying to, and you can't figure out how to build that with a student.”

As a way of collaborating with other teachers, two of six members recommended that it might be valuable for teachers to collaborate across divisions, focused on the same child longitudinally. Lower school teachers, middle school teachers and upper school teachers could watch the same video with the intention of focusing on one child. Teacher reflections about the video, and their previous experiences with the child can be combined to find most effective teaching practices for that child.

- “It was really interesting because in Alex's class, I noticed that Tanner was in the back, and Tanner is a student I would never put in the back.”
- “I was glad to see Patrick put himself out there, but he...I also noticed at the beginning of Michael’s lesson, he was trying to earn a little street cred from his peers.”
- “I would say writing is not Beck’s favorite thing. He loved to read, but writing was more challenging for him. That’s why I wondered if Beck picked his own seat in the back or Michael created a seating chart for the class.”

Summary of Findings for Research Question 3

The immersive design of VRPT training provided evidence to support members in successfully creating a virtual reality experience that promoted teachers’ ability to see and feel the classroom as a student. Experiencing the classroom as a student appeared to strengthen teachers’ efficacy towards using VRPT as a professional development tool in three main ways—

the autonomy to choose their own focus, a desire for more variety and length of film, and the promotion of teacher collaboration.

CHAPTER 5

RECOMMENDATIONS

Virtual reality perspective taking (VRPT) is an immersive, embodied experience of watching a 360-degree video footage using a virtual reality headset, which allows viewers to be emplaced within a particular space and time, with autonomy to choose where and with what to engage (Walshe & Driver, 2019). As 360-degree video and virtual reality headset technology becomes more commercially available, the ease of implementing them into teacher education will increase (Van Loon et al., 2018).

The purpose of this mixed-method action research study was to explore the effect of virtual reality perspective taking on teachers' cognitive empathy. VRPT, as designed in this study, consisted of two teachers from lower school, two teachers from middle school and two teachers from upper school, viewing a 10-minute, 360-degree video of their classroom. As part of the study design, teachers also viewed 360-degree video of two other classrooms using virtual reality headsets. Due to the small sample size and the limited exposure to the treatment, the results of this action research study shall not be generalized. Although the change was small, there was positive changes in teachers' cognitive level of empathy from pre-test to post-test following the intervention. The measurement instruments used to inform the action research questions included the Interpersonal Reactivity Index survey, semi-structured interviews, and a focus group discussion. Specifically, the interviews and a focus group discussion were employed to understand how empathizing with students might impact teacher-student interactions and teaching practices.

Two themes emerged regarding how empathizing with students might impact teacher-student interactions—physicality and student engagement. Regarding teaching practices, three themes emerged—pace, feedback, and lesson set-up. Interviews and focus group discussion also served to support teachers in their reflection on the effectiveness of VRPT as a professional learning tool in the context of Henry & Isabelle School. Three themes emerged, regarding VRPT as a professional learning tool—viewer autonomy, a desire for more content, and collaboration. The analysis of qualitative data included multiple coding methods as prescribed by Saldaña (2016). Furthermore, unintended outcomes revealed themselves in the study. One teacher expressed that she felt a special connection with some of the students, reminiscing about conversations they shared in the past. However, she did not experience the same level of emotional connection with all students. This selective sense of connection may lead to selective helpful behavior by the teachers (Batson et al., 1995). Findings from Batson et al. (1995) indicate participants who were induced to feel empathy towards a particular subject were significantly more likely to violate the principle of fairness, providing preferential treatment towards the subject (Batson et al., 1995).

Summary Findings for Study in Relation to Extant Research

Action Research Question 1

To what degree does teachers' empathy toward students change after receiving VRPT training focused on empathy building? VRPT offers an immersive, virtual environment that allows teachers to experience complex, real situations and contexts offering teachers unprecedented opportunities to understand the classroom setting. Pre- and post-survey results from the adapted Interpersonal Reactivity Index survey were employed to compare teachers' levels of perspective-taking, empathetic concern, personal distress, and fantasy.

I was unable to compute statistical differences given the small ($N=6$) sample size of this exploratory study. Nonetheless, the descriptive findings do suggest particular patterns. IRI score on perspective taking increased by 0.66, empathic concern increased by 0.51, personal distress increased by 0.51 on a 5-point scale. There was a substantial increase of 1.35 for fantasy on a 5-point scale (Table 13). Although the IRI scores increased, the differences were small, and caution should be exercised in interpreting the findings. The small change in mean scores could be attributed to their existing, high levels of empathy prior to VRPT training. Nevertheless, the results suggest that when teachers experience a student's perspective using 360-degree video of their classrooms, as designed in this research study, there was an increase in teachers' overall level of empathy in all four categories of IRI. This is consistent with the research of Schutte and Stilinović (2017), which demonstrated virtual reality experience has the potential to influence interpersonal emotions such as empathy. In addition, virtual reality perspective taking exercises appear to allow viewers to step into someone else's shoes, through a perceptual illusion called embodiment, and promote empathy-related responses (Bertrand et al., 2018).

Action Research Question 2

What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving VRPT training focused on empathy building? Analysis of participants' responses to semi-structured interview questions and a focus group discussion served to indicate their perceptions on empathy's impact on teacher-student interactions and teaching practices.

All teachers in the study were able to experience their virtual classroom as a student and two themes emerged from data analysis in terms of teacher-student interactions—noticing aspects of physicality within the classroom and noticing student engagement.

Physicality. Regarding how empathizing with students might impact physicality in the classroom, teachers were able to think about how they can create effective learning spaces for students, as well as, how the space could best serve the purposes of the teachers providing instruction. Thinking about the classroom space, while taking the perspective of the student, may help teachers and administrators understand how to improve the design of effective learning environments in the context of Henry & Isabelle School. Reflection is a “dynamic process that is embodied at the level of the biophysical through perception” (Ibrahim-Didi, 2015, p. 238). This process of embodied reflection supports Dewey’s (1933) notion on the critical nature of hands-on learning. Pairing the embodied nature of VRPT, with an opportunity to reflect on what teachers saw and felt during the video, creates a first-person learning experience that supports Ibrahim-Didi (2015) and Dewey’s (1933) research on teacher learning.

Within the theme of physicality, teachers also noticed movements in the classroom. All six teachers expressed an ability to gauge the approximate distances between themselves as teachers and students using VRPT. Five teachers expressed that close physical proximity with students directly demonstrates a level of care. Three teachers were surprised at their lack of physical movement toward students, and they expressed disappointment for the mismatch observed between their perceptions of physical movement versus their actual physical movement captured and viewed on video. This observation is consistent with the research of Theelen et al. (2019), which demonstrated after viewing 360-video, teachers improved their ability to notice classroom events. According to Theelen et al. (2019), effective teachers continuously scan the classroom, giving them opportunity to notice relevant classroom events.

After taking the perspective of the student, teachers felt that voice tone and volume from teachers and students have direct implications toward student learning. Teachers felt that their

tone of voice may unintentionally sound imposing to students. Two teachers spoke explicitly about their plans to intentionally change their tone of voice during lessons to improve teacher-student interaction. Teachers also expressed that they have missed valuable feedback from students with quieter voices. After experiencing VRPT, teachers noticed they interacted more with students who are louder than students who are typically quieter. Three teachers expressed that they are now more intentional about where they stand in the classroom, and how much interaction they provide quieter students. This is consistent with the research of Hauralt et al. (2018) and Bertrand et al. (2018), which indicate that 360-degree video training systems can provide users with novel interaction mechanisms, specifically for the purpose of learning interpersonal skills.

Student Engagement. Another theme emerged regarding how empathizing with a student might impact teacher-student interactions: student engagement. Student engagement is considered by many educators to be an important aspect of teaching and learning because it can influence students' retention, learning, achievement test scores and graduation (Appleton et al., 2008; Violante et al., 2019). Teachers felt that seeing and experiencing the classroom as a student helped them reflect on student engagement in three distinct ways: teacher-student engagement, student-curriculum engagement and noticing misperceptions about student engagement.

Regarding how empathizing with students may impact teacher-student engagement, teachers felt that it was important to actively look for opportunities to engage with students to improve learning. Mary Beattie (2001) wrote, "good teachers are centrally concerned with the creation of authentic relationships and a classroom environment in which students can make connections between the curriculum of the classroom and the central concerns of their own lives"

(p. 3). Five out of six teachers expressed the significance of leveraging students' interests to build connections between themselves and their students. Two teachers spoke specifically about the emphasis placed on relational teaching in the context of Henry & Isabelle School. An upper school teacher stated that teachers at Henry & Isabelle School are encouraged to be available for on-site and off-site communication from students and they are recommended to provide feedback to students within 24 hours. According to Klem and Connell (2004), students become more disengaged from school as they progress from elementary to middle to high school. By high school as many as 40–60% of students become chronically disengaged from school. The level of engagement between the teacher and the student directly impacts the level of student learning (Schutte & Stilinović, 2017; Warren, 2014). The results of this action research study support and extend existing research on VRPT's ability to support teacher-student engagement (Beattie, 2001; Schutte & Stilinović, 2017). Noticing and taking action on ways to build healthy, teacher-student engagement through VRPT will ultimately improve student learning.

Teachers also felt that the immersive nature of watching 360-video on a virtual reality headset provided insights to students' engagement towards their work in a profound way. Bogner et al. (2002) found effective teaching strategies can be organized into decisions regarding motivational atmosphere, classroom management, and curriculum and instruction. After analyzing the level of engagement between the student and their work, teachers were able to either affirm their teaching practices or provide alternative means of instruction that may yield more engagement from students to the curriculum. One teacher noticed that her student continued to complain about his lack of progress to his peers, at the same time, she also saw that he was not working towards the goal of completion. A different teacher stated that he goes through his curriculum each year with two specific goals in mind: to design curriculum that is

relevant to the students' real world and to plan activities that will challenge their existing knowledge to move students toward deeper understanding.

Empathizing with students also helped teachers notice a mismatch between their perception of a student and what they actually observed in the 360-degree video. One teacher found that a student who she often struggled to manage focused on meeting the lesson goals that day. In fact, she noticed that the student was trying to encourage other students to stay on task throughout the video. She expressed concern about how many teachers, including herself, intentionally and unintentionally carry misperceptions about students throughout their day, which impacts teaching practices and ultimately, student learning on a day-to-day basis. This finding is complimentary to Walshe and Driver's (2019) research on developing reflective teachers using 360-degree video. Participants in the study noted that "sometimes observations made whilst watching the 360-degree video contradicted teachers' initial reflections without video" (Walshe & Driver, 2019, p. 101). Eisenberg et al.'s (2010) research on empathy states, if the other's situation is unfamiliar, then imagining how one would think and feel as the other in the situation, may provide a useful basis for perceiving the other's state. However, if the others' responses to given situations are different from your perception of how they might respond, then focusing on how one would think, and feel may prove misleading (Eisenberg et al., 2010). If teachers can improve their ability to juxtapose their perception of student engagement with an objective viewpoint of actual, student behaviors, then teachers are more likely to prepare an effective learning environment for their students. The ability for VRPT to support teachers in providing an objective viewpoint of the classroom builds on Theelen et al. (2019)'s research on 360-degree video's affordance towards helping teachers better describe observed, classroom behavior.

Teaching Practices. VRPT is a vehicle intended to support teachers by providing an immersive, first person perspective of the classroom environment. The use of VRPT experience provides teachers with the opportunity to relive their own classroom's experience, but also seeks to challenge their assumptions supporting their teaching practices (Theelen et al., 2019). Analysis of data revealed three distinct ways empathizing with students helped teachers reflect about their teaching practices—pace, teacher feedback, and lesson set-up.

Regarding how taking the perspective of the students impacted pacing, teachers felt it was important for students to direct the pace of their own learning after experiencing VRPT. One teacher expressed a need to think more critically about using answer sheets, so that she does not impede the natural pace of learning for her students. Hartman et al. (2017) presented a research study describing the experiences and reflections of school leaders who shadowed students for a day. Their research raised several questions about how sustainable school change might look if school leaders asked students how they learn best (Hartman et al., 2017). The questions are as follows: "I wonder how school could become more learner-centered. How much homework is too much? Do our kids have enough time just to be kids? How can we get kids some reflection time during the day?" (Hartman et al., 2017, p. 52). When teachers are better equipped to empathize with students and their lived experiences, they are better able to meet the student's actual needs (Walshe & Driver, 2019). This study extends beyond previous research on the need for teachers and school leaders to better understand how students feel throughout their day, in terms of pacing, to narrow the definition of effective teaching for every child.

Regarding how taking the perspective of a student may impact teacher feedback, teachers expressed an ability to reflect on the type of feedback they provide students in the context of their classroom. Specifically, one teacher felt she needed to find the right balance between

guiding a student towards learning versus feeding students answers. Another teacher felt that it was unfair to design a department-wide grading system where teachers deduct points away from introverted students, due to their lack of participation in classroom discussions. She felt that it was important for her to offer other opportunities for students to earn participation points. Teachers felt that VRPT provided evidence to affirm their current practices on providing feedback or helped them think of other ways to offer feedback to their students. According to Warren (2014), feedback from teachers can serve to communicate academic needs of the student, but it can also aid in creating a classroom atmosphere where students feel comfortable and safe. Warren's (2014) research on empathy also found that students must feel as if the teacher is a trusted source for quality feedback and that they are safe from judgment.

Regarding how teachers' cognitive empathy might impact teaching practices, teachers also felt that they would change the way they set up a lesson. One teacher expressed that any lesson can be great, if the teacher can provide a tangible way for students to build a connection to the lesson. Another teacher felt that her set-up of the music composition lesson was ineffective. Even though she thought the subject matter would be interesting to her students, as evidenced by her prior years of experience, she realized her delivery did not engage students to the lesson. The ability for VRPT to demonstrate the quality of lesson set-up builds on research by Theelen et al. (2019). In Theelen et al.'s (2019) study, teachers used words such as imposing, objecting, or non-directing to describe the beginning of class. In addition, teachers noticed it took too much time to acquire silence, rules and consequences were unclear, and students were not allowed to ask questions (Theelen et al., 2019). Teacher's ability to sufficiently plan and efficiently deliver a lesson will improve teacher's effectiveness towards improving student learning outcomes (Stronge, 2018).

Action Research Question 3

What are teachers' perceptions regarding the efficacy of VRPT as a tool to facilitate professional development? Analysis of participants' responses to semi-structured interview questions and a focus group discussion served to indicate their perceptions of efficacy towards VRPT at Henry & Isabelle School.

The immersive design of VRPT training provided evidence for supporting members in successfully creating a virtual reality experience that promoted teachers' ability to see and feel the classroom as a student. Experiencing the classroom as a student appears to strengthen teachers' efficacy towards using VRPT as a professional learning tool in three ways—the autonomy to choose their focus, a desire for more variety and length of film, and the promotion of teacher collaboration.

Viewer Autonomy. Regarding VRPT's affordance towards providing viewer autonomy, this action research supports Walshe and Driver (2019) and Violante et al.'s (2019) findings on the perceptual capacity of 360 video to allow teachers the autonomy to choose where they looked in the video. All six teachers felt they were able to look around and notice aspects of the classroom with the ability to change their viewpoint at will. One teacher explicitly stated that the more they used the technology, the more comfortable they felt looking around.

Desire for More Content. Regarding teacher's efficacy towards using VRPT as a professional learning tool at Henry & Isabelle School, teachers desired to view more content. The design of this study limited the length of the video to approximately 10 minutes. Further studies on VRPT should incorporate longer and more diverse scenes to understand how the increase in content may impact teachers' views on VRPT as a professional learning tool. Three teachers expressed a desire to see themselves interact with students in more contexts, such as

passing back a quiz, coaching on the basketball court and providing firm or soft feedback on student behavior. However, one teacher felt that as someone who has a history of migraines, she would feel leery about how often she would experience the video. Another teacher stated that she did not enjoy the feeling of embodying a student through virtual reality. She stated that, as someone who has a strong sense of self, inhabiting a student's space, felt unnatural.

Collaboration. Regarding teacher's efficacy towards using VRPT, teachers saw it as a tool that could allow collaboration across various subject disciplines, as well as provide opportunities for teachers to collaborate across grade-level divisions. One teacher explicitly stated it would be interesting to see a particular student, that a teacher might be struggling to connect with, learning in other contexts. Viewing the child in other learning contexts might help teachers notice ways to connect with the student and consider teaching practices that might have better learning outcomes for that child. This finding is consistent with research by Tripp and Rich (2012), which states teachers prefer to engage in video analysis for reflection in collaboration with other teachers over reflecting alone and feel that the most important recommended changes come from these collaborative groups. This research study also builds on Theelen et al. (2019) work on using 360-degree videos to improve teacher interpersonal vision, which found that most teachers learned from observing other teachers teach and their interactions with students.

Adoption of new technologies that can create innovative and engaging learning opportunities is creating new approaches to old challenges. The benefits of empathizing with students through virtual reality perspective taking is a step towards a more empathic and effective educational practices.

Implications for Practice

Dewey (1933) provided one of the earliest definitions of reflective teaching as an “active, persistent, and careful consideration of belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it ends” (Dewey, 1933, p. 9).

Empathy is the piece of the teacher-student interaction puzzle that connects what a teacher knows or thinks about students to what he or she actually does when negotiating appropriate responses to students’ needs, or when the teacher is arranging learning experiences for students (Warren, 2014). Supporting empathic practices for teachers by improving the ability to take on the perspective of a student is coherent with Dewey (1933) and Warren’s (2014) research. This action research study has revealed several noteworthy implications for practice leading to the following recommendations and as referenced in Table 14.

Table 14*Recommendations Related to the Findings of the Action Research*

Finding	Related Recommendations
1. Teachers' level of cognitive empathy increased in all four subcategories of empathy, as defined in IRI survey, after experiencing VRPT.	Provide other 7th grade, 8th grade and 12th grade teachers with VRPT experience at Henry & Isabelle School
2. Teachers' cognitive empathy impacted teacher-student interactions in two areas—physicality and student engagement.	Other 7th grade, 8th grade and 12th grade teachers at Henry & Isabelle School take the perspective of the student using VRPT. Continue to engage the cycle towards noticing new empathic practices, regarding physicality and student engagement. Measure changes to teacher behavior towards evidence for positive, teacher-student interactions. Provide teachers opportunities to collaborate with other teachers from different divisions and departments aimed to reflect on teacher-student interactions.
3. Teachers' cognitive empathy impacted teaching practice in three areas—pace, teacher feedback and lesson set-up.	7th grade, 8th grade and 12th grade teachers at Henry & Isabelle School take the perspective of the student using VRPT. Continue to engage the cycle of trying new empathic teaching practices, regarding pace, teacher feedback and lesson set-up. Measure changes to teacher behavior towards more empathic teaching practices. Provide opportunities to collaborate with other teachers in different divisions and departments aimed to reflect on empathic, teaching practices.
4. Teacher efficacy's regarding VRPT as a professional learning tool increased in three areas—viewer autonomy, desire for more content, and collaboration.	Future implementation of VRPT shall include multiple viewing opportunities for teachers, as more experience with this technology points to an improved sense of efficacy towards viewer autonomy. Explore how shooting longer videos with more diverse contexts, for example, teachers coaching an athletic activity, teachers providing virtual lessons, or teachers leading advisory groups, may impact teachers' experience using VRPT. Provide time for 7th grade, 8th grade and 12th grade teachers to use VRPT with a framework for reflection, and provide collaboration opportunities across subject departments and across grade-level divisions aimed to reflect on empathic practices.

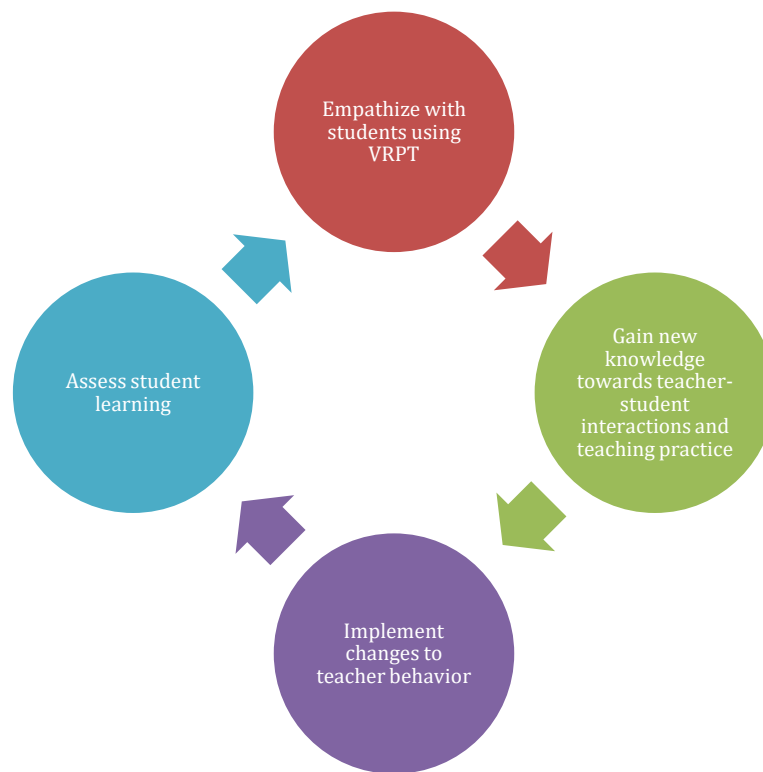
Note. VRPT = Virtual Reality Perspective Taking

Clearly, it is premature to offer a definitive model for practice, especially given the small scale of this study (sample size of six teacher participants and three instances of using VRPT per teacher as the actual treatment). Despite the exploratory nature of this study, I would like to offer a preliminary and possible feedback loop model (Figure 9) for how teachers may begin acquiring student perspectives using VRPT, including how those perspectives may help guide instructional

decision-making. This model closely follows Kolb’s Reflective Learning Cycle (Kolb, 1984). As depicted in Figure 9, the first phase of empathy’s application is to gain student’s perspective of the classroom, as demonstrated in this study. The second phase is to acquire new knowledge toward improving teacher-student interaction and teaching practices. The third phase is the application of practice supported by new knowledge gained through empathizing with students. Finally, close the loop by observing for positive change towards student learning.

Figure 8

Proposed Phases of Empathic Practice, Driven by Virtual Reality Perspective Taking (VRPT)



Practice Recommendation 1. In this current study, findings suggest that all four categories of empathy scores increased from pre-VRPT to post-VRPT. Therefore, it is recommended that efforts are made for more Grades 5, 7, 8, and 12 teachers at Henry & Isabelle School to empathize with students through professional learning tools, such as VRPT. As

evidenced in this study, as more teachers experience the classroom environment from the student's perspective, their ability to empathize will improve and in return, teachers may adjust their interaction with students and implement more effective teaching practices.

Five teachers reported that the use of a guiding framework (e.g., rubric, checklist, teaching principles) might help to focus their reflection. However, one teacher preferred to choose their own focus. Thus, administrators should find a balance between the use of a predetermined reflection framework and teachers' choice of focus within that framework.

Practice Recommendation 2. This research design helped six teachers at Henry & Isabelle School empathize with their own students and reflect possible ways in which cognitive empathy might impact the way teachers interact with students. Therefore, other Grades 7, 8, and 12 teachers at Henry & Isabelle School should be provided with opportunities to reflect specifically on teacher-student interactions after using VRPT. After reflecting on teacher-student interactions, teachers should measure changes to their own behaviors toward evidence for positive, teacher-student interactions. Teachers should also continue to engage the proposed cycle (Figure 9) towards more empathic practices, regarding physicality and student engagement, as evidenced from this study. Finally, providing opportunities for teachers to share empathic practices regarding teacher-student interactions with other teachers may provide invaluable recommendations toward student learning.

Practice Recommendation 3. This research design helped six teachers at Henry & Isabelle School empathize with their own students and reflect on possible ways in which cognitive empathy might impact the way they teach. Therefore, other Grades 7, 8, and 12 teachers at Henry & Isabelle School should be provided with opportunities to reflect on teaching practices after using VRPT. After reflecting on their teaching practices, those teachers may

narrow their understanding of empathic teaching practices and ultimately, correlate changes to their teaching practice with student learning outcomes. Finally, Henry & Isabelle School is recommended to provide teachers with space and time to collaborate with other teachers on empathic teaching practices, as teachers further develop their understanding of empathic teaching practices.

Practice Recommendation 4. All six teachers stated they would support future use of VRPT as a professional development tool in the context of Henry & Isabelle School. There are a few important practical implications for VRPT for future implementation with teachers. All six teachers stated that as they experienced more videos, they felt more comfortable about looking around and noticing more elements of the classroom. Therefore, findings from this study support applying multiple viewing cycles of VRPT to improve viewer autonomy. Viewing the video once allowed the six teachers in this study to reflect on elements of teacher-student interaction and teaching practices from their own classrooms, as well as, other classroom environments. Future studies may attempt to understand if increasing the number of viewing cycles may lead teachers to reflect differently about teacher-student interactions and teaching practices, compared to findings from this study. Two teachers also stated they would like to explore how experiencing more diverse contexts may impact teachers' experience using VRPT. Therefore, next cycles of study may incorporate longer 360-degree video recordings of teachers in more diverse contexts. For example, videos may include teachers coaching athletics, providing virtual lessons, or leading advisory groups. Providing opportunities for teachers to take student perspectives in a diverse setting may generate more ideas towards empathic teacher behaviors throughout a student's typical day. Findings in this study also suggest, all six teachers saw VRPT as a tool that might allow natural collaboration across various subject disciplines, as well as

provide opportunities for teachers to collaborate across grade-level divisions. Therefore, other Grades 7, 8, and 12 teachers at Henry & Isabelle School should be provided with opportunities to collaborate with other teachers aimed to improve empathic teacher behaviors.

Recommendations for Future Research

As this study only involved one cycle of action research, it would be valuable to engage in additional cycles of action research to further refine the findings on the impact of teachers' cognitive empathy on teacher-student interactions and teaching practices. By staying in research for a longer duration, teachers' ability to see and feel the classroom as a student may be more refined, further revealing the influence of teachers' cognitive empathy on teacher-student interactions and teaching practices.

The design of this study helped six teachers at Henry & Isabelle School understand how students might experience the classroom and leverage that knowledge to narrow the definition of empathic teacher-student interactions, and empathic teaching practices. It would be beneficial to determine the efficacy of the recommendations, such as providing more Grades 7, 8, and 12 teachers at Henry & Isabelle School with VRPT training, and allow more voices and feedback to sharpen and improve empathic, teacher behaviors. The recommendation to support collaboration among teachers after experiencing VRPT, designed to improve the ability to empathize with students, might allow other themes to emerge focused on teacher-student interactions and teaching practices. Literature supports that caring deeply and empathically about children and their welfare has been identified as being at the heart of purposeful teaching, essential to personal happiness and critical to inspiring children to care about their own learning (Bertrand et al., 2018; Warren, 2014). Kosko et al. (2020), Theelen et al. (2019), and Walshe and Driver (2019) separately recommended that teachers, as part of a bigger professional learning community,

should take the perspective of the student using 360-degree video, to assist them in discovering new ways to improve teacher-student interactions and teaching practices. If other Grades 7, 8, and 12 teachers at Henry & Isabelle School do not take the time to reflect on students' perspectives, they might miss opportunities to build teacher-student engagement, remain unknowledgeable about the level of student engagement towards the curriculum or continue to carry misperceptions regarding student behavior.

Findings presented here support the ability of VRPT to help six teachers in the context of one, college-preparatory private school, take the perspective of a student in their classroom. These findings have important implications for future research and practice for 360-degree video and virtual reality technology in education. At the time of this study, a consumer-grade 360-degree camera, which records 4K resolution video, is approximately \$200, and each Oculus Go headset costs approximately \$200. Video editing software, which has the capacity to edit 360-degree videos, costs approximately \$300. As technology improves, both the capacity of 360-cameras and the ability for facilitating user embodiment will also improve. Costs associated with this technology will also decline. Understanding of broader feasibility and affordability issues, in terms of recording, editing, and creating 360-video and stereoscopic audio, needs to be further developed if this type of training is desired at scale.

Recording and leveraging video footage to support teacher reflection is not a new concept (Kosko et al., 2020). However, there is a need to further explore the benefits of viewing 360-degree videos through a virtual reality headset aimed to gain the perspective of the student. The theoretical framework of this action research study delimited six teachers in one particular private school to reflect on their own practices. However, future studies on the use of VRPT for educational practices might focus on VRPT's ability to supplement or replace classroom

observations by administrators. Previous studies (Theelen et al., 2019; Walshe & Driver, 2019) provide evidence to support VRPT use with pre-service teachers on noticing various elements of the classroom when combined with a framework for reflection. Building onto previous studies regarding the effectiveness of VRPT with pre-service teachers, future studies at Henry & Isabelle School may focus on VRPT's impact on inexperienced teachers' ability to empathize with students and the subsequent effect on their teacher-student interactions and teaching practices. Stronge et al. (2008) states all schools need principals to exercise their roles as instructional leaders who ensure the quality of instruction (p. 4). Heads of school divisions and department leaders at Henry & Isabelle School may leverage VRPT to provide guidance and support for teachers who lack classroom experience towards more empathic teaching practices, ultimately towards better student outcomes.

Summary

Research demonstrates empathic teachers are more effective in inspiring students to change poor work habits and to learn than non-empathic teachers, because empathic teachers are more likely to connect with their students (Lam et al., 2011). Herbek and Yammarino (1990) have demonstrated that empathy is an important instructor variable that positively affects learning outcomes by creating a psychologically safe learning environment. If empathy is an important variable for producing positive learning environments, and ultimately enhances student learning, it is logical to see if teacher training may lead to changes in empathic ability.

Herrera et al. (2018) provided empirical evidence to support VRPT's potential to increase user empathy. The transition from an expensive, physically permanent device to a light, cost-effective price point improves the likelihood of experiencing embodiment through virtual reality headsets for mass users (Bertrand et al., 2018). This study is important in determining the impact

of empathy on teacher-student interaction and teaching practices after experiencing VRPT. It is apparent that participants at Henry & Isabelle School improved their ability to empathize with students through VRPT. Improving teacher's ability to empathize with students has and will lead to more positive teacher-student interactions and effective teaching practices.

Kolb (1984) referred to his model of the Reflective Learning Cycle, consisting of four phases of training after experience training: (a) participants reflect on the experience, (b) participants formulate guiding principles, (c) participants apply their learning, and (d) participants receive feedback. VRPT, as designed in this study, should not be used as an evaluative tool, but rather as a vehicle to reflect on one's own actions and inaction, in terms of interaction with students and teaching practices. After reflecting on one's own behaviors, one can formulate possible changes towards more effective instructional practices. After implementing changes to teacher behavior, teachers can look for positive outcomes, in terms of student learning.

Indeed, the results of this action research find support for leveraging teachers' cognitive empathy, to understand ways in which teachers can improve teacher-student interactions and find more empathic teaching practices. The application of these results will benefit the lives of individuals immersed and committed to the hard work of teaching and building relationships with their students at Henry & Isabelle School.

APPENDIX A

PARTICIPANT CONSENT FORM

I, _____, agree to participate in a research study to understand the role of virtual reality perspective taking on teachers’ cognitive empathy. In addition, purpose of this study will explore the influence of teachers’ cognitive empathy as it relates to teaching practices and teacher-student interactions. Finally, this study seeks to understand teachers’ perceptions regarding the efficacy of virtual reality as a means of professional development

I understand that my participation in the study is purposeful in that the teachers volunteered and were selected with the intention of providing a representation of elementary school teachers, middle school teachers and upper school teachers at Henry & Isabelle School utilizing virtual reality perspective taking training. I understand that six teachers will be selected to participate in this study.

I understand that all teachers in the training program will be asked to participate in the action research process and that my participation in the study is purposeful and voluntary. Data collection will be ongoing throughout the cycle from January, 2020 through June, 2020. I understand that data collection methods will include one semi-structured interview and one focus group discussion.

I understand that my responses will be confidential and that my name will not be associated with any results of this study.

I understand there is no personal risk or discomfort directly involved with this research and that I am free to withdraw my consent and discontinue participation at any time. I agree that should I choose to withdraw my consent and discontinue participation in the study that I will notify the researcher listed below, in writing. A decision not to participate in the study or to withdraw from the study will not affect my relationship with the researcher, the College of William and Mary generally or the School of Education, specifically.

If I have any questions or problems that may arise as a result of my participation in the study, I understand that I should contact Dong Shin, the researcher at phone number 540-272-5443 or dbshin@email.wm.edu or Dr. James Stronge, his dissertation chair at phone: 757-221-2411 or jhstro@wm.edu. You may also contact Dr. Tom Ward at (757) 221-2358 or tjward@wm.edu. My signature below signifies that I am at least 18 years of age, that I have received a copy of this consent form, and that I consent to participating in this research study.

DATE

Signature of Participant

DATE
Participant information

Signature of Researcher

Which gender do you identify as? Male ____ Female ____ Other

How many years have you been teaching (Henry & Isabelle School and others)? _____

What subject area(s) do you currently teach? _____

Have you used virtual reality before? If so, to what extent?

APPENDIX B

INTERPERSONAL REACTIVITY INDEX (IRI)

(M. Davis, 1980)

The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter on the scale at the top of the page: A, B, C, D, or E. When you have decided on your answer, fill in the letter on the answer sheet next to the item number. **READ EACH ITEM CAREFULLY BEFORE RESPONDING.** Answer as honestly as you can. Thank you.

ANSWER SCALE:

A	B	C	D	E
DOES NOT				DESCRIBES ME
DESCRIBE ME				VERY
WELL				WELL

1. I daydream and fantasize, with some regularity, about things that might happen to me. (FS)
2. I often have tender, concerned feelings for students less fortunate than me. (EC)
3. I sometimes find it difficult to see things from the students' point of view. (PT) (-)
4. Sometimes I don't feel very sorry for students when they are having problems. (EC) (-)
5. I really get involved with the feelings of the characters in a novel. (FS)
6. In emergency situations, I feel apprehensive and ill-at-ease. (PD)
7. I am usually objective when I watch a movie or play, and I don't often get completely caught up in it. (FS) (-)
8. I try to look at students' side of a disagreement before I make a decision. (PT)
9. When I see a student being taken advantage of, I feel kind of protective towards them. (EC)
10. I sometimes feel helpless when I am in the middle of a very emotional situation. (PD)
11. I sometimes try to understand my students better by imagining how things look from their perspective. (PT)
12. Becoming extremely involved in a good book or movie is somewhat rare for me. (FS) (-)

13. When I see a student get hurt, I tend to remain calm. (PD) (-)
14. Students' misfortunes do not usually disturb me a great deal. (EC) (-)
15. If I'm sure I'm right about something, I don't waste much time listening to students' arguments. (PT) (-)
16. After seeing a play or movie, I have felt as though I were one of the characters. (FS)
17. Being in a tense emotional situation scares me. (PD)
18. When I see students being treated unfairly, I sometimes don't feel very much pity for them. (EC) (-)
19. I am usually pretty effective in dealing with emergencies. (PD) (-)
20. I am often quite touched by things that I see happen. (EC)
21. I believe that there are two sides to every question and try to look at them both. (PT)
22. I would describe myself as a pretty soft-hearted person. (EC)
23. When I watch a good movie, I can very easily put myself in the place of a leading character. (FS)
24. I tend to lose control during emergencies. (PD)
25. When I'm upset at a student, I usually try to "put myself in his shoes" for a while. (PT)
26. When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me. (FS)
27. When I see someone who badly needs help in an emergency, I go to pieces. (PD)
28. Before criticizing a student, I try to imagine how I would feel if I were in their place. (PT)

NOTE: (-) denotes item to be scored in reverse fashion

PT = perspective-taking scale

FS = fantasy scale

EC = empathic concern scale

PD = personal distress scale

A = 0

B = 1

C = 2
D = 3
E = 4

Except for reversed-scored items, which are scored:

A = 4
B = 3
C = 2
D = 1
E = 0

APPENDIX C

SEMI-STRUCTURED INTERVIEW PROTOCOL

INTERVIEW QUESTIONS

DIRECTIONS: This is a semi-structured interview. Major questions are printed in bold print, with follow-up probes in regular type. Each question shall be asked with the teacher's responses recorded and transcribed.

Introduction

As you know, I am interested in learning about how empathy may play a role in how we teach what we teach and how we teachers interact with students.

-Teachers' cognitive empathy can be defined as the teacher's ability to understand what students are thinking and feel how students are feeling in the classroom.

RQ2

- 1. How would you describe the role of empathy in your work with students?*
- 2. Could you please describe what you saw and experienced during virtual reality perspective taking?*
- 3. Keeping the student's perspective in mind, what did you notice about the way the teacher interacted with you as the student? What are some ways that a teacher might adjust their interaction with students?*
- 4. What did you notice about how the teacher taught the class? How might a teacher adjust their teaching practice after seeing the world through the students' perspectives?*
- 5. After experiencing this process, how might you describe changes to your level of understanding on how students think and feel in classrooms?*

RQ3

- 1. Okay, now let's shift our focus to virtual reality perspective taking as a professional development tool. Have you received professional training on empathy in the past? What did you think about the overall quality of the training?*
- 2. How did taking the student's perspective in virtual reality support you to reflect on your own practice? How (if at all) do you think VRPT will affect your interaction with students or teaching practice going forward?*
- 3. How (if at all) do you think using VRPT was different from using 'normal' video? Do you think experiencing the reality of a student from their perspective added value to your current practice?*
- 4. Was there anything about using VRPT that you did not find helpful or wish could be added to improve its effectiveness for improving empathy or teaching practice?*
- 5. Would you recommend this process to your peers? Why/why not?*

APPENDIX D

FIELD TEST EMAIL REGARDING INTERVIEW QUESTIONS

This field test will be employed to determine any necessary improvements to the interview questions in order to demonstrate the validity of the study's instruments.

Dear Colleagues, I am currently beginning the dissertation for my doctoral program at William & Mary. For my dissertation, I will be conducting action research with six teachers. In the context of Henry & Isabelle School, I would like to understand the following three questions for my dissertation proposal. They are as follows:

Q1 - To what degree does teachers' empathy toward students change after receiving virtual reality perspective taking training focused on empathy building?

Q2 - What are teachers' perceptions about how the role of cognitive empathy impacts their classroom interactions with students and their teaching practices after receiving virtual reality perspective taking training focused on empathy building?

Q3 - What are teachers' perceptions regarding the efficacy of virtual reality perspective taking as a means of professional development?

To measure these three questions, I have created semi-structured interview questions following the training. I need to determine if the interview questions will actually answer the three, overarching research questions above. Please offer honest feedback and suggest changes or elimination of questions that you feel do not belong. Your feedback will be confidential.

Interview Question Feedback

Interview Questions	Suggestions for change
<p><i>RQ2</i></p> <ol style="list-style-type: none"> <i>1. How would you describe the role of empathy in your work with students?</i> <i>2. Could you please describe what you saw and experienced during virtual reality perspective taking?</i> <i>3. Keeping the student's perspective in mind, what did you notice about the way the teacher interacted with you as the student? What are some ways that a teacher might adjust their interaction with students?</i> <i>4. What did you notice about how the teacher taught the class? How might a teacher adjust their teaching practice after seeing the world through the students' perspectives?</i> <i>5. After experiencing this process, how might you describe changes to your level of understanding on how students think and feel in classrooms?</i> <p><i>RQ3</i></p> <ol style="list-style-type: none"> <i>1. Okay, now let's shift our focus to virtual reality perspective taking as a professional development tool. Have you received professional training on empathy in the past? What did you think about the overall quality of the training?</i> <i>2. How did taking the student's perspective in virtual reality support you to reflect on your own practice? How (if at all) do you think VRPT will affect your interaction with students or teaching practice going forward?</i> <i>3. How (if at all) do you think using VRPT was different from using 'normal' video? Do you think experiencing the reality of a student from their perspective added value to your current practice?</i> <i>4. Was there anything about using VRPT that you did not find helpful or wish could be added to improve its effectiveness for improving empathy or teaching practice?</i> <i>5. Would you recommend this process to your peers? Why/why not?</i> 	

APPENDIX E

FOCUS GROUP PROTOCOL

Phase 1: Before the focus group meeting:

1. Complete the Interpersonal Reactivity Index survey before the experiment.
2. Conduct the experiment with each participant.
3. Complete the Interpersonal Reactivity Index survey after the experiment.
4. Conduct semi-structured interviews with each participant.
5. Generate focus group questions by aligning themes from individual interviews and research questions.
 - a. Have experts in the field of virtual reality and empathy review focus group questions to make sure that questions will yield the kind of information I am seeking.
6. Email questions to participants at least one week ahead of the focus group meeting.

Phase 2: Conduct the focus group:

1. Prepare the materials
 - a. Bring copies of focus group questions printed for each participant.
 - b. Focus group list of participants
 - c. An audio recorder
2. Arrive before the participants to set up the zoom room.
 - a. Email Zoom room link a week prior to the focus group and a reminder email the day before the focus group meeting.
 - b. Test the video and audio features.
3. Introduce myself and each participant to the group. Ask permission to record the meeting and explain that information is confidential, and no real names will be used for reporting.
4. Conduct the focus group, being mindful of the following:
 - a. Set a positive tone.
 - b. Make sure everyone is heard; draw out quieter group members.
 - c. Probe for more complete answers.
 - d. Monitor questions and the time closely.
 - e. Thank participants and tell them what your next steps are with the information.

Phase 3: Follow-up

1. Send a summary of the meeting to the participants to ask them to verify the accuracy of the findings.

FOCUS GROUP QUESTIONS

Focus Group Questions Which Address Action Research Question 2

1. What were some of your general impressions of using VR to view your classroom as a student?
2. One theme that was especially consistent throughout the 1 on 1 interviews was this idea of embodied reflection. Every participant said that they were able to experience various aspects of the classroom as a student. Could someone please explain how seeing and feeling the classroom as a student might impact the way you interact with students?
3. Along the same vein, how might this experience impact the way you might prepare and deliver a lesson?
4. Another theme that emerged from the interviews was a desire to collaborate with other teachers using this technology. Could someone tell the group how this training may or may not encourage collaboration among teachers?
5. More specifically, how might collaborating with other teachers, after the training, impact the way you might interact with a student? I'm asking specifically about teacher-student interactions with this question.
6. How might collaborating with other teachers, after the training, impact the way you might prepare and deliver a lesson? So here, I'm asking more specifically about your teaching practices.

Focus Group Questions Which Address Action Research Question 3

1. Now in terms of this training as a professional development tool, what did you think about the overall usefulness of VRPT, in terms of empathizing with students?
2. As teachers, we come to the classroom with our own subjective points of view, prejudices, biases, and personal experiences, all of which inform our approach on how we interact with students and how we teach. In what ways (if any) did you notice a misalignment between your perceptions of the classroom or students with real, observed needs of students? Again, a reminder that everything you say here will be confidential.
3. What is your experience with the technical aspect of VR? (Comfort of headset, quality of video or sound...etc.)? Which part worked well, and which part needed improvement?
4. I would like to know your thoughts about the content of the video. You experienced a variety of scenes, such as 1-on-1 lessons, small group lessons, lectures etc., Which content helped you the most, in terms of reflecting about your interactions with students and the way you prepare and deliver a lesson?
5. Lastly, how (if at all) do you think this experience will affect your work with students going forward?

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