Creating Mixed Reality Scenarios to Assess Danielson's Fourth Domain

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Article Info

Article History

Received:
4 May 2024
Accepted:
7 October 2024

Keywords

Teacher preparation
Mixed reality
Performance assessment
Technology
Danielson's fourth domain

Abstract

This paper describes how a teacher preparation program overcame an identified challenge- limited student access to field placements - by creating an original mixed reality scenario (MRS) that immerses learners in real-time teaching situations. In this case, a virtual Individualized Education Plan (IEP) meeting that requires special education majors to collaborate as a member of a multidisciplinary team (MDT) to establish annual goals and specially designed instruction to meet a fictitious student's academic, social, or behavioral needs. Student perception surveys were used to determine the authenticity, relevance, and applicability of the MRS. The original tool was found to be an effective performance evaluation to assess skills aligned with Danielson's fourth domain, Principled Teaching. The components of this domain were previously regarded as a difficult skills to develop and assess in preservice teaching. The use of this MRS redefines teacher preparation by providing authentic learning opportunities for special education majors to practice skills in a professional learning environment that were not previously available to them.

Introduction

The Danielson Framework and Experiential Learning

Charlotte Danielson's framework for effective teaching is widely used as an evaluative tool for teaching effectiveness and teacher-readiness across Pre-kindergarten through grade twelve (PK-12) and higher education institutes. The research-based framework includes four domains: Planning and Preparation, Learning Environment, Learning Experiences, and Principled Teaching; each designed to capture the complexity of "good teaching" across all grade levels and in response to diverse student abilities (Danielson, 2022). It can be used formatively, through self-assessment or coaching, to develop preservice teachers' skills across each domain.

Teacher preparation programs have relied on experiential learning (a clinical education model) where preservice teachers are provided opportunities in PK-12 classrooms to extend upon their classroom learning with practical and skills-oriented instruction under the supervision of a skilled and experienced practitioner. The supervisor provides coaching and assesses students' knowledge, abilities, and dispositions; often using evaluative instruments based on Charlotte Danielson's Framework for Teaching (2022). While preservice teachers' content knowledge and instructional skills are easily observable in clinical settings, often one's dispositions and skills related to principled teaching, or professionalism, are more difficult to observe and assess.

As defined by Danielson (2022), the fourth domain identifies six elements of effective teaching that do not occur during direct student-teacher interactions. Rather, they "reflect practices of educators that extend beyond their classrooms and the learning experiences they facilitate" (p.51). As such, proficiency in these components is not easily evidenced in the clinical education setting (or in campus classrooms). Teacher preparation programs could find it challenging to assess this domain and may consider most of its components: Engaging in Reflective Practices, Documenting Student Progress, Engaging Families and Communities, Contributing to School Community and Culture, Growing and Developing Professionally, and Acting in Service of Students; skills that emerge and develop once the teacher enters practice.

Mixed Reality Scenarios

For the last half-century, simulations have been used in education (Cruickshank & Broadbent, 1970). In recent years, technology-based mixed reality scenarios (MRS) have emerged. Marrying human and artificial intelligence in a live and interactive virtual environment of avatars, these learning technologies create realistic and responsive experiential learning opportunities that can be used as part of teacher preparation to develop and assess all components of effective teaching- including those in Danielson's fourth domain. During an MRS, using a platform such as Mursion™ or TeachLivE™, the learner typically stands or sits in front of a large screen monitor that displays avatars in a virtual environment. In the case of education-themed mixed reality scenarios, the pre-service teacher interacts in real time with diverse avatars who, depending on the scenario, can represent students, school professionals, or families in simulated school settings, such as classrooms or conference rooms. The learner engages with the avatars in authentic ways. The interaction occurs in real-time, and the avatars respond uniquely to the learner's actions. This allows learners to immerse themselves in the MRS; experiencing a suspension of disbelief, where they temporarily accept the avatars and situation as real (Hayes et al., 2013).

Recent research has evidenced the effectiveness of MRS in teacher preparation. These studies have focused on the development of specific, discrete skills during direct instruction, such as eliciting student thinking or classroom management routines in regular education classrooms (Dieker et al., 2014), special education classrooms (Dieker et al., 2016), and teaching diverse students such as English Learners (Regalla et al., 2016) and those with autism spectrum disorder (Vince Garland et al., 2016) in an inclusive classroom.

During the 2018-19 academic year, a teacher preparation program at a small, private university in Northeastern Pennsylvania began using MRSs as preparation for, or in complement to, their students' clinical education experiences. Faculty-led small group instruction in a simulation lab was used as fish-bowl experiences where students gain confidence in discrete skills prior to, or in addition to, participating in field experiences. As part of didactic instruction, the faculty member models the teaching strategy prior to turning control of the MRS over to a student for guided practice. The student becomes immersed in the MRS while their classmates and instructor observe. The student can pause the scenario as needed for coaching. This social and collaborative approach to learning with real-time coaching is evidenced-based (Dasan, 1994; Grossman, 2005; Logan et. al, 2005; Straub, 2015; Vygotsky, 1976) and is not immediately available to students in the clinical education setting.

Recently, the teacher preparation program extended its use of MRS in response to limited clinical experiences as a result of the COVID-19 pandemic. In addition to the developmental fish-bowl experiences, their students participated in 1:1 remote scenario through the use of a Zoom™ platform. Led by a host avatar, they honed their teaching skills in a virtual classroom and then were prompted to reflect on their performance by the host. Students identified their strengths and weaknesses and then had an opportunity to repeat the scenario and strengthen their skills. The 1:1 session was recorded and shared, allowing a faculty member to assess student performance and provide the student with an artifact of their learning experience.

Although the program's use of MRS within the program evolved, it was still centered on instructional aspects of effective teaching. Seeking to address an identified programmatic weakness, limited student access to and participation in an Individualized Education Plan (IEP) meeting, faculty partnered with Mursion™ to create a custom scenario that requires their students to collaborate as a member of a multidisciplinary team (MDT). A fictitious student profile was created and documented through the creation of a Reevaluation Report (RR) that students read prior to engaging in the MRS. Then, in the role of special education teacher, teacher preparation students facilitate the virtual IEP meeting, collaborating with members of the MDT (a regular education teacher, a speech language pathologist, and the student's parent) to establish annual goals and specially designed instruction that meet the student's academic, social, or behavioral needs.

Utilizing the mixed reality technology in this way maximizes the tool's functionality and its impact on the learning process. It transforms the teaching and learning process by redefining the clinical education experience by providing authentic learning opportunities that otherwise were not available due to lack of access to IEP meetings during PK-12 clinical placements. This meets the conditions required for classification at the highest level of educational technology integration according to the Substitution Augmentation Modification Redefinition (SAMR) Model (Hamilton et al., 2016). MRS redefine teacher preparation by affording pre-service teachers the opportunity to learn in new situations and contexts. It also affords the program the opportunity to assess special education teacher candidates' knowledge and skills in Danielson's fourth domain- skills that typically were associated with in-service practice.

Danielson's Fourth Domain and the Individual Education Plan Meeting

The findings in a study completed by Hong (2018) suggest that limited professional experiences in their undergraduate training and as beginning teachers result in a significant response difference (as observed in practice) between beginning teachers and veteran teachers. Additionally, Bosch and Travoe (2021) suggest that teacher training programs could be improved through the practical, experiential learning opportunities an MRS can provide. By creating an MRS centered on collaborating as a member of an MDT at an IEP meeting, the program has provided an otherwise inaccessible opportunity for preservice teachers to develop necessary skills for effective teaching. Could the use of MRS close the response gap between pre- or early-service teachers and veteran teachers by providing more authentic and experiential learning opportunities? The identification of explicit instances of interprofessional collaboration that typically occurs amongst veteran teachers and other members of the MDT during an IEP meeting revealed opportunities for the development of various skills within

the fourth domain that could account for the response gap.

Danielson (2022) contends that educators who score highly in the components within the fourth domain are typically the most dependable and professional teachers. They work in service of their students, schools, and broader communities and often act as change agents motivated by an ethic of care. An IEP meeting is ultimately an act of service to students (Component 4f). Special education teachers demonstrate care by acting with honesty and integrity as they assess student strengths, weaknesses, and needs and establish annual goals that are educationally sound and compliant with federal and state laws. Throughout the meeting and in the on-going assessment process, special education teachers advocate to ensure students have the services and supports they need to meet the established annual goals.

The IEP process relies on the accurate maintenance and reporting of academic records (Pre-refferal Report, Evaluation Report, Reevaluation Report). Each report communicates to MDT members, including family/care givers, the student's current academic achievement levels and individualized social, behavioral, and emotional needs. Documenting student progress (Component 4b) with fidelity establishes the need for an IEP and also drives the ongoing process through the collection and analysis of progress monitoring data. The outcomes from progress monitoring track development toward the attainment of annual goals in relation to the instructional and behavioral strategies being implemented. Teachers engage in reflective practice (Component 4a) as they evaluate the efficacy of the strategies and specially designed instruction in light of student growth. In the case present levels of performance are not trending toward goal attainment, new evidence-based practices are identified and integrated into practice to promote the continuous improvement of student learning and development. Reflective practice also involves teacher self-assessment to ensure that evidence-based practices are being implemented with fidelity and that instruction is culturally responsive.

Although rooted in data-informed teaching practices the IEP meeting is not driven exclusively by progress monitoring outcomes. Multiple sources of evidence including familial and cultural influences are considered when designing and assessing an education plan. When teachers engage families and communities (Component 4c) they connect a student's out-of-school life to in-school learning in a way that respects and considers cultural backgrounds and family values. This ensures the IEP goals are established in partnership with the families/care givers and that families have opportunities to provide input and feedback, which helps support and strengthen student learning.

Involving families in the establishment of the plan and seeking their input throughout the observation and assessment process promotes relationship building and fosters trust and collaboration. As special education teachers facilitate the IEP meeting, they are working collegially with other members of the MDT- questioning existing strategies and structures, proposing solutions, and challenging one another to consider multiple perspectives and to grow professionally- all in the shared effort to promote student learning. This collaborative inquiry contributes to school and community culture (Component 4d). It places the special education teacher in a leadership role as facilitator of the IEP meeting and advances the intellectual life of the school community.

The interprofessional collaboration that occurs in an IEP meeting is directly aligned with the components of Danielson's fourth domain, Principled Teaching. Therefore, participation in an MRS that requires special education majors to facilitate an IEP meeting should have potential to reduce the response gap by providing pre-service teachers with authentic and experiential learning that mimics the professional experience that would typically account for the response difference in this particular educational setting.

Research Design

Student Perception Surveys (SPS) measure theoretically informed dimensions of instruction (Wallace et al., 2016) and can provide a resourceful assessment framework of teaching quality, particularly when new instructional technologies are being introduced (Campbell & Ronfeldt, 2018). An anonymous SPS was used to determine the value, applicability, relevance and authenticity of the MRS, *Collaborating as a Member of an MDT*.

Preservice teachers enrolled in a sophomore level course, IEP: Process and Procedure, participated in the MRS, *Collaborating as a Member of an MDT,* in a 1:1 remote setting. Prior to participating in the MRS, students did receive direct instruction to develop knowledge about the educational and legal aspects of IEPs and had multiple opportunities for guided and independent practice on related skills such as interpreting educational reports, writing annual goals, selecting SDI, and progress monitoring. All students were provided with the fictitious student's Reevaluation Report (RR) prior to their scheduled scenario and had time to read it and develop a plan for facilitating the virtual meeting. Complementing the RR was a Scenario Guide (See Appendix A) that introduced them to the setting and the other members of the MDT. It also clearly identified the learning goals and intended outcomes (1. Establish two annual goals and specially designed instruction that meet the student's academic, social, or behavioral needs; 2. Gain buy-in from the other members of the MDT). The preservice teachers were familiar with mixed reality scenarios because they had utilized the same technology earlier in their program, although they had not engaged in this particular scenario.

At the end of the 2022-23 academic year, preservice teachers that had participated in the MRS (N=127) were surveyed to determine the value, applicability, relevance and authenticity of the scenario. Quantitative outcomes from the SRS indicate that 93% of students consider the experience was worth the time invested, 89% considered it applicable to their future practice, 87% felt the simulation was authentic and similar to something they would face in a real-life setting, and 93% thought it was a tool all future teachers should use.

Qualitative outcomes from the same survey instrument were coded into common themes and analyzed. Findings reinforced the quantitative outcomes, particularly comments regarding the authenticity ("it felt like I was in a real classroom") and relevance ("gave me a real experience", "what teaching is like in real life"). They also revealed that students gained confidence as a result of the simulation and that students valued having the opportunity to practice and then improve their skills.

The recorded, 1:1 sessions were viewed by the authors. Instances of students demonstrating skills aligned with

Danielson's fourth domain were noted by related component. The notes were analyzed collectively, the evidence of the development of skills related to each component is presented in Table 1.

Table 1. Using Mixed Reality to assess Danielson's Fourth Domain

Components of Danielson's (2022) fourth domain	Related skills evidenced by students immersed in *Collaborating as a Member of an MDT*
4a. Engaging in Reflective Practice	Accurately interpreting the effectiveness of Specially Designed Instruction (SDI) and progress monitoring as reported in the RR Considering multiple forms of evidence as indicators of effective teaching practices Modifying instructional strategies in response to observations about student learning and individual need
4b. Documenting Student Progress	Accurately and efficiently documenting progress toward achieving IEP goals Collecting outcomes from multiple sources and reporting them accurately and accessibly as part of the IEP meeting Involving students in progress monitoring, as appropriate
4c. Engaging Families and Communities	Engaging families in instructional decisions Seeking information about out-of-school life, family culture, and values and considering those as part of instructional decisions and goal setting Planning to make informative and accessible updates about progress to family members Gaining buy-in from family to promote learning and development
4d. Contributing to School Community and Culture	Collaborating with members of the MDT to establish goals Seeking input and feedback from the MDT members as learning outcomes, goals, ad SDI are considered Taking a leadership role in facilitating the pace and direction of the meeting
4e. Growing and Developing Professionally	Being receptive to feedback from the MDT members Working collaboratively to integrate others' feedback into the instructional plan Deepening pedagogical and content knowledge (of self and others) by exchanging information with the MDT members

Components of Danielson's (2022) fourth domain	Related skills evidenced by students immersed in *Collaborating as a Member of an MDT*
4f. Acting in Service of Students	Establishing a welcoming and respectful environment Exhibiting integrity and ethical conduct Ensuring compliance with district, state, and federal regulations Developing and maintaining positive rapport with the members of the MDT Advocating for student needs and interests Making educationally-sound decisions and using evidence-based practices

Crosswalking the elements of Danielson's fourth domain with the skills evidenced through participation in the custom MRS reveals multiple pathways for students to develop skills that previously were considered to emerge only as a result of actual practice. By leveraging the functionality and design of the MRS, the creators were able to transform their teacher preparation program by redefining how elements of principled teaching can be developed in preservice special education teachers. Through repeated practice, the MRS has potential to close the response gap between preservice teachers and veteran teachers by providing more authentic and experiential learning opportunities in this particular educational setting within the fourth domain.

Discussion and Conclusion

As preservice teachers engaged in the MRS and facilitated the virtual IEP meeting a variety of opportunities to demonstrate proficiency in Danielson's fourth domain were observed. They had to reflect on the learner's previous instruction and interpret progress monitoring data using the evidence presented in the student's RR. Accurately maintaining, interpreting, and reporting progress monitoring data and learner outcomes was necessary to ensure established goals have or can be met throughout the course of the IEP.

Prior learning had to be synthesized and applied to accurately assess the student's academic, social, and behavioral needs and create IEPs with accommodations and/or modifications that reflect effective practices for each unique exceptionality. Effective and culturally appropriate communication with families and other members of the MDT established rapport and set a tone of professionalism and collegiality. It also bridged the home-school connection and strengthened buy-in across the MDT. Collaboration was essential to establishing annual goals, specially designed instruction, and daily program requirements that will support individual learning needs.

The use of MRS in teacher preparation allows teacher candidates to practice discrete skills in a safe space, supported by peer and faculty coaching, and is supplemented by opportunities for reflection and improved practice. The experience was perceived by the preservice special education teachers to be authentic, with team members providing real-life responses that are case-dependent and unique to each scenario. Because it requires

preservice teachers to apply skills in an educational setting formerly inaccessible to them, it redefines teacher preparation. Further, this original MRS can be conceived of as a way to decrease the response differences observed by Hong (2018) between preservice and veteran special education teachers by increasing the number of professional experiences special education majors have prior to entering the profession. Findings from this study also reinforce those presented by Bosch and Trevo (2021) that indicate teacher training programs could be improved through the practical, experiential learning opportunities an MRS can provide.

As a result of this study, the authors recommend further research to determine what other areas of teacher preparation can be improved through the use of MRS. The authors emphasize the need to consider using MRS to develop and assess skills and knowledge that are not necessarily accessible or available in the course of existing teacher preparation. By doing so, this educational technology can redefine teacher preparation by affording preservice teachers the opportunity to learn in new situations and contexts.

Further studies should also be done to extend this study's findings. Survey items directly related to the components of Danielson's fourth domain would allow better insight into the types of skills and abilities participation in this particular MRS is likely to develop. It may also lead to more generalizable outcomes through the development of an evaluation instrument that could standardize the assessment of student engagement in this particular MRS. Ongoing research will lead to new knowledge about how to most effectively leverage this educational technology within the context of teacher preparation.

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Appendix A. Scenario Guide

Learner-Facing Vignette:

You are a **special education teacher** meeting with a Multidisciplinary team (MDT) that includes the General Education Teacher (Darius), Speech-Language Pathologist (Dani), and Jimmie's guardian, Max Mullen-Hardy. Jimmie, Max's son, has been in a 4th grade inclusive classroom. This is a regularly scheduled IEP meeting to re-evaluate progress and see if any changes need to be made to create appropriate and measurable annual goals and specially designed instruction.

In preparation for this meeting, you will have reviewed the summary report of the student's Revaluation Report (RR).

Jimmie lives at home with his mother, father, and 2 younger siblings. According to his teacher, Darius, he is a pleasure to have in class. He is quick to follow directions and works hard and tries his best. He is independent and is able to follow classroom routine. Jimmie can be interrupted during tasks and transition from one activity to another. Jimmie is pleasant, cooperative and excited to learn. He is able to remain in his seat and raise his hand to answer a question or ask for help. He adapts well to change. He responds well to the classroom behavior system and regularly receives rewards for good behavior. His favorite prize is lunch with the teacher. Jimmie enjoys playing with his friends and has built strong relationships.

Outcome:

Your goal is to work collaboratively with the MDT to develop at least 2 annual goals in conjunction with at least 2 specially designed instructions (SDI).

Strategies/Best practices to consider:

- Gain buy-in from the general education teacher to support Jimmie
- Check for the teacher's understanding about the method, frequency, and reporting of the progress monitoring plan.
- Collaborate to create a concrete action plan that employs at least 2 clear annual goals creating a behavioral objective using four criteria:

  Given_____ (Students name) will_____at a rate or measure of_____.

  For example…. Given a cold read, Jimmie will read aloud for one minute on a 3.1 level with an oral reading fluency of 120 words per minute and a retell of 50 words per minute.

Information about Intensity Range:

Low to Medium Behavior Challenges

Low intensity sessions are meant to build confidence for the learner. This setting is recommended for first time learners. Medium intensity sessions are meant to challenge the learner and require them to think on their feet.

Note about Establishing Intensity:

In a group setting the intensity level is a set level established by the facilitator for the duration of the session.

In a 1:1 setting, the student may select their intensity level (facilitator/teacher will access video later).

Supplemental Materials:

Reevaluation Report