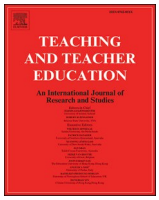
Teaching and Teacher Education 133 (2023) 104276

Contents lists available at ScienceDirect

Teaching and Teacher Education

journal homepage: www.elsevier.com/locate/tate



Research paper

Unlocking the potential of introduction to teaching courses through simulations☆

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ARTICLE INFO

Keywords:
Simulations
Introduction to teaching
Classroom management
Teacher education

ABSTRACT

Introduction to teaching courses are often tasked with helping students make an informed career choice and building their knowledge of the field. In this mixed-methods study, we investigated 98 students' responses to a challenging, mixed-reality simulation and which factors influenced their responses. Our goal was to understand the utility of simulations for introduction to teaching courses. We found that students generally perceived the simulation as challenging and useful, with many building skills during practice and sharing new insights into teaching afterwards. Students' prior experiences working with children were associated with their performance and perceptions. Implications for teacher education are discussed.

1. Introduction

Schools in the United States are facing a teacher shortage as large numbers of teachers exit the field and fewer new teachers enter, a shortage that has only grown more acute since the beginning of the Covid-19 pandemic (Title II Reports: National Teacher Preparation Data [Title II Reports], 2018; Rodriguez Delgado, 2021; Steiner & Woo, 2021). Many teacher education programs use an introduction to teaching course to introduce potential teachers (PTs) to the field of education and to help them make informed career decisions (e.g., University of Southern Maine [USME], 2020; University of Wisconsin Plattesville [UWP], 2021). For example, at the University of Southern Maine, the introductory teaching course is tasked with providing PTs an "introduction to the study of education," and "opportunities to … evaluate their interest in … teaching" (USME, 2021), while at the University of Wisconsin in Plattesville, the course provides an "introduction to the broad fields of teaching," and "an exploration of teaching as a career choice" (UWP, 2021). Unlike many teacher preparation courses, introduction to teaching courses can enroll a wide range of students across years, career paths, and majors as the courses are often offered both as an early prerequisite for future education majors and as a general elective, open to all students (Rightmyer & Larson, 2003; Thomas et al., 2020; Villeme, 1972; USME, 2021). As fewer students express an interest in teaching or enrolling in teacher education (ACT, 2016; Sutcher, Darling-Hammond, & Carver-Thomas, 2016), these gateway courses have become ever more important.

A key component of many introduction to teaching courses is a field placement. The field placement, which can range from tutoring ten times to spending 30 h in a K-12 classroom, is one way that teacher educators try to inform PTs about the field and aid in their career choice (Bowling Green State University [BGSU], 2020; Coffey, 2010; Donnell, 2010; Villeme, 1972). PTs often enter introduction to teaching with widely varying backgrounds and experiences working with children, factors which could influence how they respond to and learn from their field experiences (Marso & Pigge, 1986; Rightmyer & Larson, 2003). While the relationship between PTs' prior experiences and field experiences is unclear, teacher educators, in general, find that field experiences can shape PTs' knowledge of teaching, their perceptions of schools, their interest in teaching, and their pedagogical skills (Coffey, 2010; Heinz, 2013; Thomas-Richmond et al., 2020; Wasburn-Moses et al., 2012). In the past, many introduction to teaching field experiences were in person at schools (Coffey, 2010; Donnell, 2010; Villeme, 1972), but in the wake of the pandemic, some teacher educators have begun to explore alternative field experiences that could complement in-person experiences (Choate et al., 2021; Ellis et al., 2020; Theelen et al., 2019). Still unknown, however, is how well the benefits PTs find in field experiences translate to virtual experiences.

Simulations are one option for virtual field experiences. Mixed-reality simulations, like those provided through the Mursion platform used in this study, let novices interact with animated avatars of students

☆ We would like to thank Julie Cohen for her support and mentorship with this project.

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https://doi.org/10.1016/j.tate.2023.104276
Received 18 December 2020; Received in revised form 29 May 2023; Accepted 24 July 2023
Available online 5 August 2023

in digitally constructed classrooms. The avatars, who are remotely controlled by a trained voice actor, respond in real time, providing an approximation of the exchange that typically occurs between teachers and students without putting real students at risk or requiring access to real classrooms (Cil & Dotger, 2017; Dieker et al., 2013; Theelen et al., 2019). While simulations have been used in teacher education courses to support novices (e.g., Cohen et al., 2020; Theelen et al., 2019), we know little about how useful these practice opportunities would be in introductory courses, how PTs would respond to them, or what factors might shape PTs' responses.

To understand the potential utility of simulations for introduction to teaching courses, our study focused on the experiences of almost one hundred introduction to teaching students who participated in a challenging, simulated teaching opportunity as part of their course. Our goal was to understand how PTs responded to a practice opportunity that was both virtual and challenging, how the practice opportunity influenced their knowledge of teaching, and what factors influenced their performance and reactions to the simulated practice opportunity.

2. Literature review

While newer to introduction to teaching, simulated experiential learning opportunities are already used in teacher preparation in ways that could inform their use in introductory courses (Dieker et al., 2013; Kaufman & Ireland, 2016; Theelen et al., 2019). The practice-based teacher education movement has focused on providing teacher candidates with opportunities to see representations of practice, to analyze and decompose teachers' practice, and to engage in approximations of practice, where they take on the role of a teacher in a situation of, often, reduced complexity (Grossman et al., 2009). For students who have already decided to become teachers and enrolled in teacher education, experiential learning opportunities can provide a reality check, helping teacher candidates identify areas for improvement early in their teaching practice and experience some of the challenges of the profession (Korthagen, 2010; Westwick & Morris, 2015).

Computer based, mixed-reality simulations are an increasingly popular way to integrate more experiential learning opportunities into teacher education (Dieker et al., 2013; Kaufman & Ireland, 2016; Theelen et al., 2019). Designed to be realistic and challenging, mixed-reality simulations have the benefit of not requiring actual classroom settings which provides flexibility in the timing, focus, and location of practice (Dieker et al., 2013). While inherently less realistic than practice in real classrooms, mixed-reality simulations also have several unique affordances for teacher education (Dieker et al., 2013; Kaufman & Ireland, 2016). One affordance of simulations is that unlike in K-12 classrooms, the responses of the student avatars can be scripted and customized to meet the needs of novices (Cohen, Wong, Krishnamachari, & Berlin, 2020; Hudson et al., 2018).

A second affordance of simulations is that part or all of the experience can be standardized, providing teacher candidates with shared practice opportunities and facilitating the development of performance rubrics (Cohen et al., 2020; Pas et al., 2016). Teacher educators can use performance rubrics to assess students' needs for support and to understand how each student responds to the shared experience (Cohen et al., 2020; Pas et al., 2016). Kolb (2015; Kolb & Kolb, 2017) posits that, for growth to happen students need their experiences scaffolded. By using performance rubrics, teacher educators can gain insights into how different scaffolds shape students' performance and target interventions for students (Gerich et al., 2015, 2017). Teacher educators can also examine which student characteristics and experiences are associated with performance, allowing them to make informed decisions about supports and about the utility of the practice opportunities for different groups of students (Gerich et al., 2015, 2017).

2.1. Simulated practice for challenging skills: classroom management

Classroom management is a key concern of novice teachers, as well as a cause of teacher attrition (Harmsen et al., 2018; Ingersoll, 2001). Classroom management is also an area where simulations can both be helpful and limited. Classroom management can be challenging for teacher candidates to practice in real classrooms (Billingsley & Scheuermann, 2014; Pankowski & Walker, 2016). Mentor teachers often handle non-compliant behavior rather than handing it to novices, and only a few behaviors might occur during novices' time in the mentor teacher's classrooms (Dieker et al., 2013; Hudson et al., 2018; Pankowski & Walker, 2016). In the simulator, however, novices can have shared experiences of challenging management situations, like when novices in one study were asked to teach a classroom routine while students sent texts, made rude comments, and fell asleep (Hudson et al., 2018). Novices can also build their skills. For example, after interventions and practice in mixed-reality simulations, researchers find that novices engage in more effective redirections of student behaviors and use strategies likely to elicit more positive responses from students (Cohen et al., 2020; Judge et al., 2013).

Simulations, however, also have constraints (Pankowski & Walker, 2016). While in real classrooms, teachers often draw on their prior relationships and deep knowledge of students to resolve challenges, those relationships and that knowledge are missing in the artificial setting of a simulator (Cil & Dotger, 2017; Dotger et al., 2008; Pankowski & Walker, 2016). Despite these, and other, limitations, prior research shows that simulated practice opportunities, especially when paired with interventions such as individualized coaching, can improve novices' skills in classroom management (Hudson et al., 2018; Pankowski & Walker, 2016; Theelen et al., 2019). The field of teacher preparation has capitalized on the affordances of simulations for teacher education, but it remains unclear how useful simulations would be in introduction to teaching courses, with PTs who have not yet fully committed to teaching as a profession, and how PTs with differing characteristics and experiences would respond to a simulated teaching opportunity.

2.2. The possibilities of simulated practice in introduction to teaching courses

There are several affordances of simulations that are likely to be particularly relevant for introduction to teaching courses. First, simulation sessions are compact practice opportunities that often last less than 10 min (e.g., Hudson et al., 2018), making them efficient for introduction to teaching courses that have a large amount of content to cover in, typically, one semester; a time frame much shorter than the multiple semesters of teacher education programs (Donnell, 2010; Frusher & Newton, 1987; Grossman et al., 2009). Second, in simulations, teacher educators control the teaching situations that students encounter, creating shared teaching experiences for students and opportunities for introduction to teaching professors to match the teaching skills and experiences focused on in the simulator to course content and the needs of PTs (Cohen et al., 2020; Muir et al., 2013). Third, unlike field placements that involve real children, simulations use digitally mediated student avatars, which makes the simulator a safe place for PTs to make the inevitable mistakes involved in learning something new (Pankowski & Walker, 2016; Theelen et al., 2019). Fourth, simulations support the use of performance rubrics, which can provide introduction to teaching professors with insights into which PTs might need additional support before enrolling in teacher education and which PTs have strong pre-existing skills (Heinz, 2013; Klassen et al., 2020).

Finally, even short mixed-reality simulations can be enough to change participants' views of teaching (Bautista & Boone, 2015; Hudson et al., 2018), a finding particularly relevant for introduction courses tasked with helping students make informed career decisions. Given that introduction to teaching students often enter the course with differing career interests and prior experiences (Donnell, 2010;

Frusher & Newton, 1987; Marso & Pigge, 1986), it is not clear, however, whether the benefits of the technology for shaping novices' perceptions of the profession and providing shared practice opportunities would be consistent across PTs. Furthermore, given the robust findings on the role of prior experiences in shaping PTs' interest in teaching and teacher candidates' practice (Heinz, 2013; Izadinia, 2013; Westwick & Morris, 2015), it is not clear whether PTs with differing amounts of prior experience working with children would respond similarly to simulated practice opportunities or find similar utility in the practice.

3. Theoretical framework

We drew on theories of experiential learning (Kolb, 2015; Kolb & Kolb, 2017) to help us understand potential teachers' experiences with simulations. Building on the work of Dewey (2015) who wrote that "all genuine education comes about through experience" (p.25), Kolb's theory of experiential learning highlights the central role of experience in learning and the need for students to directly encounter what they are studying (Kolb, 2015). At the same time, not all experiences are educative (Dewey, 2015). Dewey (2015) argues that the experiences that are educative are ones that arouse curiosity and strengthen initiative (p.38). For teachers, some of the most educative experiences seem to come from the classroom and time spent teaching (Berliner, 1988). It is through teaching, through experimenting and accumulating experiences that teachers gain much of their expertise (Berliner, 1988; Wallace & Loughran, 2012, pp. 295–306). In teacher education, programs can help bridge the gap between classroom and practice by providing a wide range of experiences that help students integrate and build their skills and knowledge of pedagogy (Billingsley & Scheuermann, 2014).

Kolb and Kolb (2017) contend that students build deeper, richer understanding of course concepts through first-hand experiences; first-hand experiences that come with time to reflect, plan, and experiment. In the pre-occupational context, experiential learning opportunities can also increase novices' understanding of the field they might enter and influence their level of interest in a particular career (Lent et al., 2002; Spanjaard, Hall, & Stegemann, 2018). Classroom experiential learning activities can range from semester long internships to short simulations, with different affordances for each (Birt et al., 2018). In teacher education, they might include classroom placements with expert teachers and mixed reality simulations where novices can build specialized skills, like doing discrete trial training with students with Autism (Billingsley & Scheuermann, 2014).

While the theory of experiential learning has been criticized (e.g., Kayes, 2002), it remains an important framework for understanding both why students in introduction to teaching courses should experience teaching during the course, and for understanding how to scaffold PTs' experiences. In introduction to teaching courses, in-person, semester long experiential learning opportunities have both demonstrated impacts on students and known challenges (Choate et al., 2021; Coffey, 2010; Donnell, 2010; Ellis et al., 2020; Thomas-Richmond et al., 2020), but it is still unclear how educative brief, virtual experiential learning opportunities might be.

4. Research purpose

While mixed-reality simulations seem a promising way to provide additional experiential learning opportunities in introduction to teaching classes, especially when in-person opportunities are limited, the lack of research means that their usefulness, thus far, remains theoretical. To understand the potential utility of simulations in introduction to teaching courses, we need to understand whether simulated teaching experiences can change potential teachers' perceptions of teaching, affect their teaching performance, or shed light on what factors may be critical in informing their perceptions and performance.

Specifically, in this study we wanted to know:

How do potential teachers respond to challenging, simulated teaching opportunities?

How do simulated teaching opportunities affect potential teachers' perceptions of teaching?

What factors are associated with potential teachers' performance and reactions to simulated teaching opportunities?

5. Methods

This mixed-methods study draws on survey, interview, and simulation performance data from 98 students in introduction to teaching courses at a large, selective state university in the Southeast of the United States.

5.1. Simulation design

In the fall of 2019, PTs participated in two consecutive rounds of 5-min simulations using Mursion's mixed-reality technology. PTs were recruited through course instructors, and simulation sessions were built into the course as an assignment. The first author introduced the simulator and the experience during a brief presentation on the first day of class, and then returned shortly before simulation sessions to provide a more detailed explanation of the simulator, which included showing PTs a video of the technology in action, discussing the uses of simulations in teacher education, and answering questions about the experience. At that time, the first author also explained the study and obtained participant content. Prior to their session, PTs received individualized emails with their session information session details and a link to a pre-survey. The simulations were held in a simulation lab, with a large screen TV. During the simulations, five animated middle school students, all remotely controlled by a highly trained voice actor, appeared on the TV, seated at a horseshoe table.

In the simulation session, the PTs were asked to engage twice in a discussion about setting classroom norms with the student avatars. During each simulation round, at fixed time points, two avatars would engage in off-task behaviors, with one avatar engaging in only one off-task behavior and the other in five off-task behaviors. The off-task behaviors were designed to be both low-level and distracting, such as having the avatar drum on the table or respond to text messages during class. Student avatar responses were standardized to either a) continue if the participant did not effectively redirect their behavior, or b) stop if the participant provided them with a specific behavioral redirection. Overall, the simulated teaching scenario was designed to have students practice a task that occurs often in classroom environments (setting norms) while dealing with challenges that are also common in such an environment (off-task student behaviors). The two simulation sessions were designed to be parallel in that teachers were exposed to different off-task behaviors across the two sessions, but the level, intensity and type of behaviors were kept consistent.

5.2. Participants

5.2.1. Study participants

Ninety-eight PTs enrolled in three of the five sections of the university's introduction to teaching course took part in the simulations and consented to participate in this study. The PTs were almost equally female and male (50%), predominantly middle class (57%), and 60% white. A slight majority of PTs were in the second year of their undergraduate program (32%) and had not yet decided their undergraduate major (21%). Students who had decided their majors were studying education (15%), English (5%), and Economics (5%). Table 1 provides descriptive statistics about the participants.

5.2.2. Interviewees

We used stratified convenience sampling based on interest in teaching and course section to identify 31 possible interviewees out of the larger participant pool. Of these, 17 PTs agreed to be interviewed

Table 1
Demographic characteristics by sample (regression-adjusted estimates).

	Full sample	Interviewee sample
	Mean (SD)	Mean (SD)
High School GPA	3.49 (0.07)	3.40 (0.15)
Female	0.50 (0.05)	0.60 (0.14)
% Age above 21	0.36 (0.05)	0.33 (0.14)
White	0.60 (0.05)	0.60 (0.14)
Either parent were/are teacher	0.27 (0.05)	0.27 (0.13)
Mother completed college/has a graduate degree	0.84 (0.04)	0.73 (0.12)
Father completed college/has a graduate degree	0.85 (0.04)	0.73 (0.12)
Location of high school from which graduated		
Rural	0.13	0.07
Suburban	0.69	0.80
Urban	0.18	0.13
SES of high school from which graduated		
Low SES	0.04	0.00
Middle SES	0.63	0.73
High SES	0.33	0.27
Majority race of high school from which graduated		
Primarily students of color	0.09	0.13
Mixed-race	0.39	0.40
Primarily White	0.52	0.47
Achievement level of high school from which graduated		
Primarily low achieving	0.04	0.00
Primarily middle achieving	0.41	0.60
Primarily high achieving	0.54	0.40

and were compensated $20 for their time. Relative to the overall sample, the interviewees were more likely to speak languages other than English in the home, were more interested in teaching, were more female, and were more likely to be Asian American. Differences between the sample of interviewees and the overall sample are included in Table 1.

5.3. Data sources

To develop a more complete understanding of the data, we used a convergent parallel mixed methods design to gather and analyze the data, where the quantitative and qualitative data were collected at close to the same time but analyzed separately with the two strands combined for final analysis (Creswell & Plano Clark, 2018). We gathered quantitative data on PTs' background characteristics, experiences, and perceptions of teaching from pre- and post-surveys, as well as from observational rubrics scored by research team members of videos of PTs' classroom management approaches in the simulator. We gathered qualitative data on perceptions and lived experiences from the same pre- and post-surveys, as well as from participant interviews.

5.3.1. Surveys

All PTs responded to both closed- and open-ended questions during in-class pre-surveys prior to their simulations and during post-surveys immediately following their second simulation session. In the pre-survey, PTs were asked about their backgrounds, interest in teaching, and prior experiences working with children. PTs selected, from never to frequently (more than 50 h) how often in the past two years they had worked or volunteered at a school or a camp, mentored, baby sat or nannied, coached or helped coach a team, or done other work with children. Based on their responses, candidates were then classified as having very little, some, or lots of experience working with children. PTs also completed the Teacher Sense of Self-Efficacy Scale (TSES), which asks how capable they feel at impacting student learning, getting through to students, managing student behavior, and instructing students (Tschannen-Moran & Woolfolk Hoy, 2007). In addition, the PTs completed the NEO Five-Factor Inventory (NEO FFI), which provides measures of respondents' openness to experience, neuroticism, agreeableness, conscientiousness, and extraversion (Costa & McCrae, 1995). The NEO FFI has been used widely to examine personality domains among university students (Anisi, 2012), medical students (O'Tuathaigh et al., 2019) and teachers (Khalilzadeh & Khodi, 2021). Cronbach's Alpha was used as a measure of reliability, and values ranged from 0.95 for the TSES scale to 0.83 for the NEO FFI scale.

The post-survey both added new questions and repeated some of the pre-survey questions, including questions about participants' interest in teaching. One new measure was a modified IOWA Connor's rating scale, a measure that captured the extent to which the PTs saw the primary off-task student avatar as engaging in inattentive-impulsive-overactive and oppositional-defiant behaviors (Waschbusch & Willoughby, 2008). The research team modified the original IOWA Connor's rating scale, which has been shown to have high internal consistency and reliability, to include some of the behaviors from the simulation. With the current study sample, Cronbach's alpha for the modified IOWA scale was 0.87. PTs also rated the extent to which they endorsed different management approaches, such as assigning more challenging work, in response to the off-task behaviors displayed during the simulation session. In addition, PTs evaluated their own performances, rating from 1 to 10 the extent to which they thought their classroom management supported student engagement, discussed changes they made between the two rounds of simulation, reported how much mental effort the scenario required, and evaluated their overall simulation experiences.

5.3.2. Performance data

The research team designed an observation rubric to quantify PTs' approaches to setting classroom norms and redirecting off-task student behavior in the simulator (for more details on the rubric, refer to Cohen et al., 2020). A team of trained and certified coders coded a total of 194 video recordings of PTs' simulations, consisting of two videos from each participant who had complete data. For each video, coders coded a quality score measure, ranging from 1 to 10. The quality score provides an overall summary of the quality of PT's responses to avatars' off-task behaviors in the simulator and is based on the proportion of times a PT effectively redirected a student avatar's off-task behaviors, the specificity of the redirection provided, and the succinctness of the redirection provided. Effective, specific, and succinct redirections are based on the Responsive Classroom framework (2014), a commonly used pedagogical framework in American teacher preparation programs.

5.3.3. Interviews

We interviewed each of the 17 interview participants for approximately 45 min. The interviews focused on the PTs' simulation experiences, backgrounds, and interest in teaching. All interviews followed a semi-structured interview protocol and were recorded and digitally transcribed. Questions included, "What were your thoughts about the simulator?" and, "What do you feel went well?" The interviews took place several weeks after each PT's simulation session and session videos were used to assist recall of the simulation.

5.4. Qualitative data analysis

5.4.1. Open-ended survey questions

We coded the open-ended survey responses in Nvivo, a qualitative data analysis program, turning each open-ended question into a structural code for analysis. We then analyzed the structural codes through multiple readings and word frequency counts to determine whether the code would be analyzed and reported on at the structural code level or if the code would be broken into sub-codes for detailed analysis. In the end, the responses to four questions were broken into sub-codes using the codebook provided in Appendix A, with each response coded into at most one sub-code. We used key word searching, word counts, and

matrices to prevent overlap between codes and to increase consistency in coding. Throughout survey coding, to keep the sub-codes lower-inference, each open-ended question remained the primary unit of analysis. The matrices, word counts, and codebooks were all recorded in a methodological log, while insights and thoughts on coding were recorded in an analytic log, which was updated on each day of analysis (Miles et al., 2014; Yin, 2018). Once all items were coded, we engaged in thematic analysis (Saldana, 2013) to better understand the data and the relationship between prior experiences and PTs' perceptions of the simulation sessions.

5.4.2. Interviews

Immediately following each interview, we wrote an analytic memo on impressions from the interview (Miles et al., 2014). Once all the interviews were completed, they were digitally transcribed and, following the anonymizing of each transcript, another memo was written. We began coding by using the interview questions as structural codes. We then analyzed the structural codes and expanded them to include all relevant comments from a PT on a particular topic, even if shared at a different point in the interview. Next, we analyzed each structural code individually, developing inductive codes through iterative coding (Corbin & Strauss, 2008; Miles et al., 2014). Then, we looked for patterns in the data and grouped similar codes, creating codes with progressively higher levels of abstraction, and developing the final interview codebook in Appendix A (Miles et al., 2014; Yin, 2018). After developing the codebook, we went back to the data and recoded the interview responses, using visual tools in Nvivo to ensure that each response was only coded one time. As themes about PTs' prior experiences, their perceptions of the simulator, and what they saw as the benefits of the practice began to emerge across the interviews and surveys, we worked to understand how these findings converged, diverged, and related to the quantitative findings (Creswell & Plano Clark, 2018).

5.4.3. Trustworthiness

Throughout the qualitative coding process, we worked to ensure the trustworthiness of our findings. First, we maintained a detailed chain of evidence that included the detailed methodological and analytic memos we wrote throughout the coding process (Yin, 2018). Second, we checked themes across the open-ended survey responses, interview responses, and quantitative data, triangulating multiple sources of evidence to build our confidence in our findings (Yin, 2018). Third, we searched for rival explanations for our data multiple times throughout the analysis process as we iteratively revised our findings and assertions (Miles et al., 2014). Finally, we asked trusted colleagues to review our work and provide feedback on emerging themes multiple times during data analysis (Corbin & Strauss, 2008).

5.5. Quantitative data analysis

We began by descriptively summarizing PT characteristics in Table 1 and using regression models to summarize differences between the overall participant sample and interviewee sample. Next, to examine the role of prior experience working with children in how PTs performed during the simulator session, we conducted a time-series model presented in Equation (1):

$$Y_{ijt} = \beta_0 + \beta_1 Some\ Experience_{ij} + \beta_2 Lots\ of\ Experience_{ij} + \beta_3 Session\ 2_t + \beta_4 Lots\ of\ Experience_t \times Session\ 2_t + \beta_5 Some\ Experience_{ij} \times Session\ 2_t + \boldsymbol{X}_{ij(t)}\boldsymbol{\beta} + \gamma_{ijt} + \lambda_j + \varepsilon_{ijt} \quad (1)$$

Here, Y_{ijt} represent outcomes for PT i in course section j at session t (1 or 2). "Some Experience" and "Lots of Experience" are indicators for PTs' previous experience working with children. The model also includes a dummy variable, *Session* 2, that indicates which time period outcome Y was observed, as well as an experience by-time interaction to allow for differential effects across time. Equation (1) includes fixed effects for the simulation interactor and course sections, as well as for time invariant and varying controls for PTs (including gender, average achievement-level at high school, and indictors for missing covariate information). Clustered standard errors were estimated at the PT level to address the nested data structure.

In Equation (1), β_0, represents the mean outcome for the low-experience group during session 1; β_1 and β_2 represent the session 1 difference in mean outcomes for PTs in the low-experience group and PTs in the other two experience groups. β_3 represents the changes in slopes for the low-experience group between session 1 and session 2. β_4 and β_5 represent the changes in slopes for the "some experience" and "lots of experience" groups between sessions 1 and 2.

6. Results

Our results suggest that potential teachers saw the simulated teaching experience as valuable, and that PTs, especially those with less prior experience working with children, gained new insights into teaching from the simulation. In addition, we found that prior experience working with children was associated with both how PTs perceived the simulated practice opportunity and their responses to a simulated off-task student.

6.1. How potential teachers respond to challenging, simulated teaching opportunities

Potential teachers saw the simulated practice as both challenging and beneficial, a duality that was also reflected in their responses to the off-task student avatar. Approximately 60% of PTs indicated that the scenario demanded a large amount of mental effort, marking an eight or nine on a nine-point scale. When asked to explain their responses, the words "hard" or "difficult" appeared in over one-third of PTs' open-ended responses. Candidates wrote, "SO HARD- YIKES!" and, "It was exhausting because no one would listen, few could hear me, and there were so many distractions." In addition to being challenging, PTs saw the simulation as useful, with 87% marking "agree," or "strongly agree." Several PTs described the simulation as "a great learning tool," and "extremely interesting," or wrote, "It made me realize how important classroom management is." While a handful of PTs wrote that the experience was not helpful "in any way," most saw benefits in the simulation experience.

The duality of challenge and benefits was also evident in how PTs responded to the off-task avatar. PTs overall had some challenges in responding to the off-task students, scoring an average of 2.9 points on a 10-point scale of overall quality in managing off-task behavior. When asked about the extent to which their classroom management supported student engagement, PTs rated themselves an average of 5.92 points on a 10-point scale. On open-ended responses, almost half of PTs listed at least one shortcoming they saw in their management, like the PT who wrote, "I thought I was respectful and kind to the students … [but] I struggled keeping them on task more than a teacher would," and the PT who wrote, "I just did not know how to get the kids to listen to me." Despite PTs' overall low scores and their self-awareness of some challenges, Fig. 1 shows that PTs improved at setting classroom norms and addressing off-task student avatar behaviors (indicated by the upward slope of all three lines) between the first and second rounds of the simulation. Although the improvements were not statistically significant ($\beta = 0.66$ points, $p > 0.10$), the uniform pattern of improvement suggests that challenging, simulated experiences like the one in this study can help build PTs' teaching skills. Overall, the simulation challenged PTs, began to build their skills, and was seen as useful.

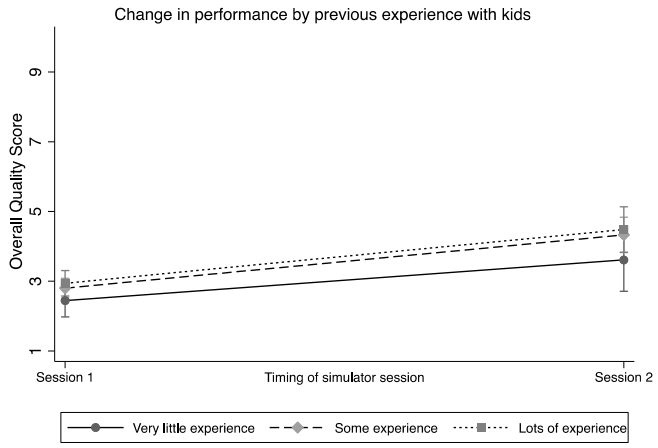

Fig. 1. Improvements in overall quality score by experience with kids.

6.2. How simulated practice opportunities influence potential teachers' perceptions of teaching

Being put into the role of a teacher trying to set classroom norms while an off-task student engaged in low-level behaviors gave potential teachers first-hand experience of a challenge teachers might face. For PTs who had more experience working with children, the simulation was an opportunity to be the leader in a classroom, like the PT who wrote, "It was cool being the only teacher there. Most times I am a teacher assistant or helper, so I'm not the one doing the hard work." One interviewee, who had nannied and volunteered with students extensively, said, "In that very brief period, I, you know, got to take a stab at managing a class, which is really the first time I have done that in a formal setting ever." Several PTs also noted that they were able to try managing a class in a low risk environment. Harmony, an interviewee who was interested in becoming a teacher, said, "It helped me understand what the classroom is like without the consequences of having actual students sitting in front of me. If I messed up, it wasn't a big deal, and I could just move on." Another interviewee compared the simulation to a "test run" where, if "something happens" "it's not … going to hurt" real students. The simulator was a place where PTs, according to a third interviewee, could gain firsthand "exposure" to classrooms "before they are placed into actual classrooms."

In addition to allowing them to take on the role of a lead teacher, the simulation also provided many of the PTs, especially those who had less experience working with children, with new insights into the complexities and difficulties of teaching. They wrote comments such as, "It made me realize how difficult teaching is," "It gave me a better understanding of how tough it is to be a teacher," and that the "eye opening" experience gave them a "more realistic view on what teaching is like and the real challenges that occur." This theme of seeing the difficulties and realities of teaching came up repeatedly in PTs' open-ended responses. PTs wrote that the simulation gave them a "a taste as a teacher," an understanding of "how difficult it is to teach a classroom of children by yourself," and a new knowledge of the "realities of working with … students." For many of these PTs, their new awareness of the challenges of teaching was paired with a heightened appreciation of teachers, like the PT who wrote, "I think that it gave me a new appreciation for teachers who deal with situations like that on a daily basis." One simulation staff member described, anecdotally, a PT commenting that he needed to call his mother, who was a middle school teacher, after the session because he had a new respect for what she did each day.

The PTs in this study were experiencing some of the challenges of being the lead teacher before they had finalized their career selection. One PT commented on the timing of the simulation, writing, "I think it is really important to have experience in a classroom situation before deciding you want to be a teacher." In general, the challenging experience of the simulator, along with PTs coursework, seems to have supported PTs' interest in teaching, which increased eight percentage points from the pre-survey to the post-survey. In her interview, one participant attributed her increased interest in teaching to the simulator, saying, "Doing the simulation I felt like … [classroom management] is a skill I could learn," and, "I've never really been an authoritative figure in a classroom, so having the time to practice helped me feel more confident in a real-life ability to do it." At the same time, three students, who had indicated little interest in teaching prior to the simulation and were more interested in fields such as business, indicated even less interest following the simulation and wrote in comments such as, "I can never be a teacher." Some PTs who were ambivalent on teaching also stated that the experience did not change their interest in teaching, although it was "really beneficial even if you're not going to become a teacher."

6.3. Factors associated with potential teachers' performance and reactions

In the simulation, the avatars engaged in the same behaviors at the same time stamps for all of the PTs. The standardization in the avatars' behaviors allowed us to look more closely at differences in responses between PTs, and to explore whether prior experiences or other individual characteristics related to PTs' performance and their perceptions of the simulation. PTs' prior experiences working with children ranged widely, from almost none to having nannied for a full summer, coached sports teams for years, or volunteered in schools weekly since high school, which allowed us to evaluate the relationship between prior experience and performance in the simulator.

Overall, PTs with more experience working with children were significantly better able to address off-task behaviors in the simulator than their peers with some or little previous experience with children, as can be seen in Fig. 1. Amy, an interviewee who had volunteered in elementary schools, coached a sports team, and baby sat, scored in the top 20% on her first simulation. In her simulations, she took under 5 s on average to respond to the off-task behaviors, while many other PTs took 20 s or longer. She also realized on her own that she needed to improve in being "more … direct and … more clear," which were key skills targeted in the simulation.

In addition to scoring significantly better on their first simulations, PTs with the greatest amounts of experience working with children also made more growth from the first to the second simulation. Fig. 1 plots the change in performance scores between session one and session two by different levels of prior experience with children. While PTs who reported low levels of previous experiences with children improved between simulator sessions one and two, their growth between sessions was flatter. Mila, an interviewee whose previous experience working with children was limited to one experience teaching computer science in high school, decreased in her score from the first to the second simulation. When asked what she changed, she said, "With the second part, I was just like, 'You're being very disrespectful to the other kids,' and showed [the off-task avatar] that he was being disrespectful." The skills targeted in the scenario were being timely, succinct, and specific in redirections. Talking with a student about being disrespectful is not specific, and so the changes Mila made caused her score to decline between rounds. Other more experienced interviewees, like Amy, focused on being clearer and more direct in the second round and so increased scores between rounds.

In interviews, some of the more experienced PTs spoke about their prior experiences addressing challenging behaviors and, at times, connected their experiences to the simulation. Harmony, "started teaching [dance] in middle school" and moved from assistant to teacher to "head coach." She compared the strategies that worked with the off-task student in the simulator to what needed to happen in dance classes with "six-year-olds" who would "try to sit down while we're dancing," a time

when she had to be "strict." In contrast, interviewees with less experience had fewer lived experiences to connect to what they saw in the simulator. Wayne, whose prior experiences with children consisted of only a few, brief volunteer experiences, had listed classroom management as a possible reason not to teach. When asked about management, he said, "Well, it's just something that I don't have much experience with … maintaining control [of] the classroom." He spoke about not being "really sure how to approach [the off-task avatar]." PTs' prior experiences also seemed linked to how they perceived the off-task avatar, with a larger number of high experience PTs describing him positively using words such as "energetic," and a larger number of low experience PTs describing him negatively, using words such as "annoying" or "disrespectful."

Furthermore, prior experience working with children also related to how PTs saw the simulated experience. While insight into teaching was the most commonly listed benefit of the simulator, closer analysis of the responses reveals that it was mostly PTs with little experience working with children who wrote that the simulator gave them new insights into teaching while PTs with more experience with children more often wrote about seeing practice as a key benefit. In interviews, more experienced PTs spoke about seeing the simulator as a place to "to test different skills and different ways that you could teach." The most inexperienced interviewees instead spoke about the simulator giving them "a really realistic idea on how elementary school students are." Keeping the scenarios consistent across PTs allowed us to isolate the role of prior experience working with children in shaping how PTs responded to a challenging simulation, which is only one example of the information that can be gained when the students vary, but the teaching scenarios stay the same.

7. Discussion

Introduction to teaching courses are often tasked with helping potential teachers make informed career decisions and building their knowledge of the field of education (e.g., USME, 2021; UWP, 2021). Given the downward trend in teacher preparation enrollment and students' interest in teaching (Title II Reports, 2018, Rodriguez Delgado, 2021; Steiner & Woo, 2021), these courses are of increasing importance. Prior research has found that protracted field experiences in introduction to teaching courses influence PTs' knowledge of the field and their interest in teaching (Lent et al., 2002; Spanjaard et al., 2018). While powerful, these in-person field experiences are also limited, with variability in what skills PTs practice and scenarios they encounter across placements and a need to prioritize the well-being of the children in the placement, which can limit what PTs practice and impact access during times like the Covid-19 pandemic (Choate et al., 2021; Ellis et al., 2020; Theelen et al., 2019). In teacher education, simulated teaching experiences have been used as a supplement to in-person field experiences and to build teacher candidates' skills (Hudson et al., 2018; Pankowski & Walker, 2016; Theelen et al., 2019). Simulations have, however, not yet been studied in introduction to teaching courses. In this study, we investigated how PTs responded to a simulated teaching opportunity, how, if at all, their perceptions of teaching shifted, and what factors influenced their responses. Our goal was to understand the potential utility of the technology for introduction to teaching courses. Overall, we found that compact, customizable simulated practice opportunities were useful tools for the introduction to teaching course sections in this study.

Our first research question focused on how potential teachers responded to simulated practice opportunities. What we found was that PTs perceived the simulation as both challenging and useful, which reflects their performance during the simulation. During the simulation, PTs both experienced challenges when it came to giving specific redirections and improved between rounds of practice, although not significantly. PTs in this study saw benefits in the experiential learning opportunity, as PTs have in studies of more in-depth experiential learning opportunities (Coffey, 2010; Wasburn-Moses et al., 2012). The positive trend of growth we saw in PTs' skills at redirecting off-task behavior is also in line with findings of positive growth from simulated practice for teacher candidates (Hudson et al., 2018; Pankowski & Walker, 2016). The limited growth we saw could, in line with experiential learning theory (Kolb, 2015), reflect PTs need for more scaffolding on the content of the simulations.

The simulation in this study was focused on classroom management, which is a difficult skill to practice in the field, and a perceived area of weakness for many novice teachers (Billingsley & Scheuermann, 2014; Hudson et al., 2018; Pankowski & Walker, 2016). As would be expected from their lack of training in classroom management, many PTs struggled to redirect the off-task student avatar during the simulation. PTs struggled, however, in a safe environment, a virtual space where they could try a new skill and be imperfect without impacting the classroom experiences of real students (Hudson et al., 2018; Pas et al., 2016). We need more research to learn whether classroom management or a different skill is most helpful for PTs to practice in a simulated environment. Our findings, however, indicate that simulations can be a safe space for students in introduction to teaching to try on challenging aspects of the profession and build skills, and that PTs see utility in simulations.

Our second research question focused on the twin purposes of many introductory courses to inform students about the field of education and to help them make informed career decisions. We wanted to know whether brief simulated practice opportunities could support students in making informed career decisions and provide them with new insights into teaching. Longer, in-person experiential learning opportunities in introductory courses have been shown to influence what PTs know about teaching and how they perceive schools (Coffey, 2010; Thomas-Richmond et al., 2020). We wanted to understand whether these findings would still hold with simulated teaching opportunities, and we found that PTs gained new insights into teaching from the simulation. PTs felt that they had an opportunity to take on the role of a lead teacher and experience the challenges that a teacher faces, which many described as something they had not been able to do previously. PTs also described a new awareness of some of the challenges teachers face and the skills involved in teaching. While for a few PTs that new awareness of the difficulties of teaching cemented their desire not to become a teacher, overall PTs' interest in teaching increased from before the simulation to after the simulation. PTs gained a new understanding of how hard it can be to be the lead teacher in a classroom, and this came without a loss of interest in teaching. Simulations, based on our findings, could help introduction to teaching courses meet their goals of providing career and field knowledge. We need more research, however, to understand how to best leverage simulated practice opportunities, including the impact of different scaffolding and content foci on shaping what PTs take away from the practice.

Our third research question focused on understanding which factors influenced PTs' responses to the simulation, as that information can shape both how teacher educators integrate simulations into their introduction to teaching courses and for whom they integrate simulations. We found that PTs who had more extensive, often informal, experience working with children, such as teaching dance, nannying, or volunteering at an after school club, were significantly better at redirecting an off-task student, made more growth between practice rounds, and found different benefits in the simulation than their less experienced peers. PTs with more experience tended to describe the key benefits of the simulator as practice and being the lead teacher, while less experienced PTs tended to describe the simulator as opening their eyes to the challenges of teaching. Time spent working with children is associated with PTs' interest in teaching and their knowledge of the field (Heinz, 2013; Wasburn-Moses et al., 2012; Westwick & Morris, 2015), and, in our study, with how PTs respond to a simulated teaching task. We need more research to understand if providing less experienced PTs with more simulated practice opportunities could support their skill development

and bridge the gap between them and more experienced PTs. Overall, our findings imply that simulated teaching experiences are useful for both more and less experienced PTs, but that the benefits might vary by group in ways that could influence how, and for whom, teacher educators choose to integrate simulations into their courses.

7.1. Implications for teacher education

These findings have several implications for teacher education. Overall, our findings suggest that mixed-reality simulations can be supportive tools for introduction to teaching courses. Simulated teaching opportunities can provide PTs with new insights into the field of education and new awareness of the challenges of teaching, and do so without pushing them away from the profession. While more and less experienced PTs responded differently to the simulated practice, both perceived benefits in the practice and improved with practice, even if the amount of improvement differed. This implies that simulated practice opportunities could be useful for a wide variety of PTs in introduction to teaching courses. The simulations also provided PTs with a shared experiential learning opportunity, one that was standardized enough that we could look at differences in how individual PTs responded in the scenario. Simulations are customizable, standardizable, compact, and distance-learning friendly practice opportunities that could become useful tools for introduction to teaching courses. Despite their many advantages, simulations are also limited tools. The very customization and standardization of simulations is also a limitation, as the more simulations are standardized, the more artificial they can become, and the more customized they are, the more they can diverge from real classroom experiences (Cil & Dotger, 2017; Dotger et al., 2008). We need more research to understand both the possibilities and the limitations of simulated practice opportunities in introduction to teaching courses.

7.2. Limitations

Although this study sheds light on the potential utility of mixed-reality simulations in introduction to teaching courses, the current study is limited. First, we focused on the simulations and the PTs and did not look at classroom discussions on the simulator or interview professors. We need more research that includes the perspectives of the teacher educators using the technology and includes classroom observations to fully understand the utility of the technology. Second, the simulation itself was originally designed for teacher candidates (Cohen et al., 2020) and we need more research to understand how we can improve the design of simulated, experiential learning opportunities for introduction to teaching courses. Third, our study did not include a control group of PTs who did not participate in simulations, which limits what we can say about the impact of the simulation on PTs' performance and perceptions. Fourth, the interviewees in the study differed from other PTs in several ways, which limits what we can conclude from their interviews, and we need to hear from more PTs to understand their experiences. Despite these limitations, this study presents new and timely information on short, simulated practice opportunities in the introductory education context that can help teacher educators working to find new practice opportunities for their students.

7.3. Conclusion

The Covid-19 pandemic and the ensuing disruptions to field placements illuminated how vital it is for teacher educators to think expansively when designing and implementing experiential learning opportunities for potential teachers in introduction to teaching courses. By looking at how almost one hundred potential teachers in introduction to teaching courses responded to a simulated practice opportunity, we were able to gain insights into the potential utility of this technology for introductory courses. We found that the simulated experience challenged PTs, began to build their skills, and provided many of them with new insights into the complexities of teaching as well as with a novel practice opportunity. The benefits of the simulated experience varied by the PTs' prior experience working with children, with those with more experience engaging in more skill building and those with less engaging in more knowledge building about the field, but the simulated practice opportunity appeared broadly useful for PTs. Our findings indicate that simulations can be a useful, virtual experiential learning opportunity for students in introductory education courses, one that has unique affordances and could supplement existing field experience opportunities.

Funding

This work was supported by the Bankard Fund for Political Economy [136842.JJC78FB18.ER00562.31155]; and the Jefferson Trust at the University of Virginia [FAAJ3207].

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix A. Methodological

Qualitative Codebook for Interviews

Interview code	Description
Addressing off-task behaviors	Comments from participants about the simulated off-task student including how they perceived him, supports he would require, and actions they would take as well as broader comments on their approach to classroom management and their concerns about addressing behaviors.
Introduction to teaching	Comments on why participants enrolled in introduction to teaching and their experience in the course, including how the course has impacted their desire to teach.
Perceptions of simulated practice	Comments from participants about the simulated practice including benefits, concerns, and areas for improvement as well as the emotions they experienced in the simulator. Also includes their comments and questions on the technology and aspects of the scenario or simulation they would change.
Personal background	Comments from participants about their own backgrounds including socioeconomic status, own educational experiences, families, and mental health
Prior experience with kids	Comments from participants about prior work with kids including experiences in high school and experiences in the field placement for introduction to teaching.
Simulation performance	Comments from participants on their own performance in the simulator, what they did in the scenario, and any changes that they made during the session.
Teaching as a profession	Comments from participants on reasons that they would or would not be interested in becoming a teacher. If they want to teach, includes their comments on what and where they would want to teach.

Qualitative Codebook for Surveys

Survey question	Code description
How would you characterize Ethan's behavior in this interaction?	Negative: Negative comments describing Ethan including strongly negative comments such as "rude and defiant" to more mild ones such as "disruptive, talkative." Does not include positive language or an acknowledgement that his behavior was unintentional, stopped when asked, or were typical for his age. Neutral: Mixed or neutral comments about Ethan that acknowledge that he is disruptive or challenging but also focuses on positive or neutral traits such as being responsive and stopping when asked, being typical for his age, or his behaviors seeming unintentional. Does not use positive words such as sweet to describe him unless balance with a negative word such as disrespectful. Positive: Includes at least one positive character trait to describe Ethan such as "sweet" or "friendly." Might mention that he is disruptive but does not describe him using terms such as defiant, disrespectful, or rude.
To what extent do you think your classroom management supported student engagement in the class discussion about classroom rules and expectations?	My management did not support discussion: Responses indicating that the management did not support norms. Might describe challenges faced in the scenario like "unable to keep students attentive." Might have hint of positive like "I was able to tell them norms" or "used their distractions to set norms" but is followed with a but and list of what did not work. Might include ideas for future "I think I needed to …" along with something negative about what happened "kids didn't interact." My management supported discussion: Responses to how management supported norms left after the did not support discussion codes are removed. Comments include listing of rules set, neutral, balance, or positive comments on performance on the whole simulation. Note, remove "did not understand question responses" from this code as well so not included in either code.
What if anything was beneficial about participating in the simulator?	Exposure to reality: Comments under benefit about gaining insight into teaching and the challenges of running a classroom including comments such as "got a taste as a teacher," "able to see difficulties in real environment" and "realizing there are students like Ethan." Practice: Comments under benefit about being able to be a teacher and to practice teaching. Comments include "got to lead a class," "Tried out what we have been learning," "got experience," "cool being the only teacher there."
What, if any, concerns do you have after participating in the simulator?	Concerns about ability to teach: Comments about their ability or desire to teach such as "I found out I wouldn't be a good teacher" and "I could never teach."

References

ACT. (2016). *The condition of future educators 2015*. http://www.act.org/content/dam/act/unsecured/documents/Future-Educators-2015.pdf.

Anisi, J. (2012). Validity and reliability of NEO Five-Factor Inventory (NEO-FFI) on university students. *International Journal of Behavioral Sciences, 5*(4), 351–355.

Bautista, N. U., & Boone, W. J. (2015). Exploring the impact of TeachMETM Lab virtual classroom teaching simulation on early childhood education majors' self-efficacy beliefs. *Journal of Science Teacher Education, 26*(3), 237–262.

Berliner, D. C. (1988). *The development of expertise in pedagogy*. AACTE Publications.

Billingsley, G. M., & Scheuermann, B. K. (2014). Using virtual technology to enhance field experiences for pre-service special education teachers. *Teacher Education and Special Education, 37*(3), 255–272.

Birt, J., Stromberga, Z., Cowling, M., & Moro, C. (2018). Mobile mixed reality for experiential learning and simulation in medical and health sciences education. *Information, 9*(2), 31–45.

Early field experiences, college of education and human development. (2020). Bowling Green State University. https://www.bgsu.edu/education-and-human-development/teacher-education-program/field-experiences/early-field-experiences.html.

Choate, K., Goldhaber, D., & Theobald, R. (2021). The effects of COVID-19 on teacher preparation. *Phi Delta Kappan, 102*(7), 52–57.

Cil, O., & Dotger, B. (2017). The emergence of moral, professional, and political geographies in a clinically simulated parent-teacher interaction. *Teaching and Teacher Education, 67*, 237–245.

Coffey, H. (2010). 'They taught me': The benefits of early community-based field experiences in teacher education. *Teaching and Teacher Education, 26*, 335–342.

Cohen, J., Wong, V., Krishnamachari, A., & Berlin, R. (2020). Teacher coaching in a simulated environment. *Educational Evaluation and policy Analysis, 42*(2), 208–231.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research* (4th ed.). Sage Publications.

Costa, P. T., & McCrae, R. R. (1995). Domains and facets: Hierarchical personality assessment using the revised NEO personality inventory. *Journal of Personality Assessment, 64*, 21–50.

Creswell, J., & Plano Clark, J. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.

Dewey, J. (2015). *Experience and education: The kappa delta pi series*. Free Press.

Dieker, L. A., Rodriguez, J. A., Lignugaris, B., Hynes, M. C., & Hughes, C. E. (2013). The potential of simulated environments in teacher education: Current and future possibilities. *Teacher Education and Special Education, 37*(1), 21–33.

Donnell, K. (2010). Learning to teach: A self-study of a new teacher educator's introductory education course. *Studying Teacher Education, 6*, 227–234.

Dotger, B. H., Harris, S., & Hansel, A. (2008). Emerging authenticity: The crafting of simulated parent-teacher candidate conferences. *Teaching Education, 19*(4), 337–349.

Ellis, V., Steadman, S., & Mao, Q. (2020). 'Come to a screeching halt': Can change in teacher education during the COVID-19 pandemic be seen as innovation? *European Journal of Teacher Education, 43*(4), 559–572.

Frusher, S. S., & Newton, T. (1987). *Characteristics of students entering the teaching profession*. Paper presented at the Oklahoma Educational Research Symposium.

Gerich, M., Bruder, S., Hertel, S., Trittel, M., & Schmitz, B. (2015). What skills and abilities are essential for counseling on learning difficulties and learning strategies? Modeling teachers' counseling competence in parent-teacher talks measured by means of a scenario test. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 47*, 62–71.

Gerich, M., Trittel, M., & Schmitz, B. (2017). Improving prospective teachers' counseling competence in parent-teacher talks. Effects of training and feedback. *Journal of Educational and Psychological Consultation, 27*(2), 203–238.

Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice, 15*(2), 273–289.

Harmsen, R., Helms-Lorenz, M., Maulana, R., & van Veen, K. (2018). The relationship between beginning teachers' stress causes, stress responses, teaching behaviour and attrition. *Teachers and Teaching, 24*(6), 626–643.

Heinz, M. (2013). Tomorrow's teachers—selecting the best: An exploration of the quality rationale behind academic and experiential selection criteria for initial teacher education programmes. *Educational Assessment, Evaluation and Accountability, 25*, 93–114.

Hudson, M. E., Voytecki, K. S., & Zhang, G. (2018). Mixed reality teaching experiences improve preservice special education students' perceptions of their ability to manage a classroom. *Journal of Virtual Worlds Research, 11*(2), 1–17.

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal, 38*(3), 499–534.

Izadinia, M. (2013). A review of research on student teachers' professional identity. *British Educational Research Journal, 39*(4), 694–713.

Judge, S., Bobzien, J., Maydosz, A., Gear, S., & Katsioloudis, P. (2013). The use of visual-based simulated environments in teacher preparation. *Journal of Education and Training Studies, 1*(1), 88–97.

Kaufman, D., & Ireland, A. (2016). Enhancing teacher education with simulations. *TechTrends, 60*(1), 260–267.

Kayes, D. C. (2002). Experiential learning and its critics: Preserving the role of experience in management learning and education. *The Academy of Management Learning and Education, 1*(2), 137–149.

Khalilzadeh, S., & Khodi, A. (2021). Teachers' personality traits and students' motivation: A structural equation modeling analysis. *Current Psychology, 40*(4), 1635–1650.

Klassen, R. M., Kim, L. E., Rushby, J., & Bardach, L. (2020). Can we improve how we screen applicants for initial teacher education? *Teaching and Teacher Education, 87*, Article 102949.

Kolb, D. (2015). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Prentice Hall.

Kolb, A. Y., & Kolb, D. A. (2017). Experiential learning theory as a guide for experiential educators in higher education. *Experiential Learning & Teaching in Higher Education, 1*(1), 7–44.

Korthagen, F. A. (2010). Situated learning theory and the pedagogy of teacher education: Towards an integrative view of teacher behavior and teacher learning. *Teaching and Teacher Education, 26*(1), 98–106.

Lent, R. W., Brown, S. D., Talleyrand, R., McPartland, E. B., Davis, T., Chopra, S. B., … Chai, C. (2002). Career choice barriers, supports, and coping strategies: College students' experiences. *Journal of Vocational Behavior, 60*, 61–72.

Marso, R. N., & Pigge, F. L. (1986). *The influence of student characteristics on their reasons for entering teacher education*. College of Education, Bowling Green State University. (ERIC Document Reproduction Service No. ED 269 364.

Miles, M. B., Huberman, A. M., & Saldana, J. M. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage.

Muir, T., Allen, J., Rayner, C., & Cleland, B. (2013). Preparing pre-service teachers for classroom practice in a virtual world: A pilot study using second life. *Journal of Interactive Media in Education, 3*, 1–17.

O'Tuathaigh, C. M., Nadhirah Idris, A., Duggan, E., Costa, P., & Costa, M. J. (2019). Medical students' empathy and attitudes towards professionalism: Relationship with personality, specialty preference and medical programme. *PLoS One, 14*(5), Article e0215675.

Pankowski, J., & Walker, J. T. (2016). Using simulation to support novice teachers' classroom management skills: Comparing traditional and alternative certification groups. *Journal of the National Association for Alternative Certification, 11*(1), 3–20.

Pas, E., Larson, K., Reinke, W., Herman, K., & Bradshaw, C. (2016). Implementation and acceptability of an adapted classroom check-up coaching model to promote culturally responsive classroom management. *Education & Treatment of Children, 39*(4), 467–492.

Responsive Classroom. (2014). *The Responsive Classroom approach- Good teaching changes the future*.

Rightmyer, E., & Larson, A. (2003). Advancing knowledge of the teaching profession through web-based assignments. *The Teacher Educator, 39*(2), 131–143.

Rodriguez Delgado, C. (2021). *Schools across the country are struggling to find staff. Here's why*. *PBS*. https://www.pbs.org/newshour/education/schools-across-the-country-are-struggling-to-find-staff-heres-why.

Saldaña, J. (2013). *The coding manual for qualitative researchers* (2nd ed.). Sage Publications.

Spanjaard, D., Hall, T., & Stegemann, N. (2018). Experiential learning: Helping students to become 'career-ready'. *Australasian Marketing Journal, 26*(2), 163, 17.

Steiner, E. D., & Woo, A. (2021). *Job-related stress threatens the teacher supply: Key finding from the 2021 State of the US Teacher Survey*. RAND Corporation. Technical Appendixes. Research Report. RR-A1108-1.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Learning Policy Institute. https://learningpolicyinstitute.org/sites/default/files/productfi les/A_Coming_Cris is_in_Teaching_REPORT.pdf.

Theelen, H., van den Beemt, A., & den Brok, P. (2019). Classroom simulations in teacher education to support preservice teachers' interpersonal competence: A systematic literature review. *Computers & Education, 129*(1), 14–26.

Thomas-Richmond, J. M., Costner, R., Hit, A., & Costner, B. (2020). Education candidates' perceptions of Title I public schools. *SRATE Journal, 29*(1), 1–10.

Title II Reports: National Teacher Preparation Data. (2018). *Program completers by state: Academic year 2016 to 2017*. US Department of Education. https://title2.ed.gov /Public/DataTools/Tables.aspx.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education, 23*, 944–956.

University of Southern Maine. (2020). *School of education and human development course descriptions*. https://usm.maine.edu/school-of-education-human-development/sehd-course-descriptions.

University of Wisconsin Plattesville. (2021). *Smart catalog*. https://catalog.uwec.edu/courses/es/.

Villeme, M. G. (1972). *Attitude changes in introduction to teaching classes*. A Report of the University of South Florida. ERIC No. 079-251.

Wallace, J., & Loughran, J. (2012). *Science teacher learning*. Second international handbook of science education.

Wasburn-Moses, L., Kopp, T., & Hettersimer, J. E. (2012). Prospective teachers' perceptions of the value of an early field experience in a laboratory setting. *Issues in Teacher Education, 21*(2), 7–22.

Waschbusch, D. A., & Willoughby, M. T. (2008). Parent and teacher ratings on the Iowa Conners rating scale. *Journal of Psychopathology and Behavioral Assessment, 30*(3), 180.

Westwick, J. M., & Morris, G. A. (2015). Teacher education pedagogy: Disrupting the apprenticeship of observation. *Teaching Education, 27*(2), 156–172.

Yin, R. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage Publications.