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Performance Feedback in Teacher Preparation: Improving Preservice Teachers' Use of High Leverage Practices Through Mixed-Reality Simulation

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Challenging classroom behaviors are a leading cause of beginning teachers' stress and attrition. It has been a longstanding criticism that teacher preparation programs are not adequately providing preservice teachers with the proper strategies to help them deal with behavior problems effectively. This study examines the effects of performance feedback and deliberate practice using a mixed-reality simulation on preservice teachers' use of high leverage practices. Simulators are well suited for training preservice teachers in high leverage practices because it allows for repeated practice and opportunities for performance feedback. Findings are presented from research on the use of performance feedback and deliberate practice within a controlled environment in a teacher preparation course for undergraduate general education preservice teachers. There were significant shifts in preservice teachers use and efficacy of three targeted high leverage practices. Findings hold implications for the preparation of special and general education teachers.

Introduction

High Leverage Practices (HLPs) are a set of research-based instructional practices identified as essential for preservice and novice teachers to use in their teaching (McLeskey et al., 2017). These fundamental skills are critical in helping

students learn new content and support social and emotional development. There are nineteen HLPs for general education and twenty-two HLPs for special education that span subject areas, grade level, and content (McLeskey et al., 2017). Although, teacher preparation programs may introduce general and special education HLPs, preservice teachers face limited time to master these practices and get related performance feedback. Research shows that it is critical for preservice teachers to have opportunities to practice teaching through structured, scaffolded, and supervised experiences (Leko et al., 2015). The Collaboration for Effective Educator Development, Accountability, and Reform (CEEDAR) Center as well as a countless distinguished researchers in the field of teacher preparation have urged teacher educators to provide practice-based experiences for preservice teachers to develop mastery of HLPs (Ball & Forzani, 2011; Grossman et al., 2009; Lampert, 2010; McDonald, Kazemi, & Kavanaugh, 2013; Windschitl et al., 2012). Unfortunately, practice opportunities prior to field experience involving real students are scarce and often limited to peer role-plays and basic scenarios that do not reflect the complexities and challenges of classroom teaching.

Preparing Preservice Teachers to Actively Engage Students in the Classroom

Challenging classroom behaviors are a leading cause of beginning teacher stress and attrition (Allday et al., 2012; Conroy et al., 2009). Beginning teachers express difficulty in addressing inappropriate classroom behaviors which impact student engagement and may limit effective teacher-student relationships, both of which have been found to be predictors of student success. Students who feel supported and valued by their teachers tend to engage more and have fewer inappropriate behaviors (Berliner, 1990; Hattie, 2009). HLPs focus on developing positive learning environments that maximize student engagement, leading to improved student outcomes.

There are three HLPs that support teachers’ ability to engage students in the classroom (see Figure 1). HLPs should be taught in conjunction with evidence-based practices (EBPs). EBPs are teaching strategies that are effective for certain populations of learners and have been validated through research (Cook & Cook, 2013). Not only are preservice teachers legally mandated to use EBPs (i.e., Individuals with Disabilities Education Improvement Act, IDEIA, 2004), but literature supports the effectiveness of these strategies. When they are used effectively, they increase outcomes for students with and without disabilities (Scheeler, Budin, & Markelz, 2016; Maheady, Smith, & Jabot, 2013).

High Leverage Practice	Evidence Based Strategy
Explaining and modeling content, practices, and strategies	Explicit Modeling of Instructional Skills
Specifying and reinforcing productive student behavior	Behavioral Specific praise
Providing oral and written feedback to students	Academic Specific praise

Figure 1. High Leverage Practices that Increase Student Engagement

Figure 1 shows the alignment between three HLPs and the EBPs which teachers could be used to achieve each HLP. Specifically, these three HLPs focus on teacher modeling of content and skills and on reinforcing student academics and behavior through feedback using specific praise.

Modeling Content, Practices, and Strategies. The HLP *Explaining and Modeling Content, Practices, and Strategies* pairs with the EBP of explicit modeling, which is a strategy that is highly regarded in the field of special education (Teaching Works, n.d.). Explicit modeling occurs when a teacher explains knowledge and demonstrates a particular skill. Modeling allows all students to observe the cognitive processes involved in a specific learning strategy (Baumann, Jones, & Seifert-Kessell, 1993). Teachers can use modeling for both behavioral skills (i.e., raising your hand to answer a question) and academic skills (i.e., solving a word problem). It can also be used to demonstrate how to use cognitive processes effectively and teach students how they can self-monitor their progress (Baumann et al., 1993). Modeling is an engaging and effective teacher practice that facilitates students’ acquisition of new knowledge and skills (Higgs & McMillian, 2006). Explicit modeling is beneficial for all students, but particularly students with disabilities (Archer & Hughes, 2011).

Using Specific Praise to Reinforce and Provide Feedback

Another well-validated approach to promote a positive classroom is the use of specific behavioral praise (Allday et al., 2012; Conroy et al., 2009). Specific behavioral praise is when a teacher conveys an explicit reference to a desired behavior (e.g., “Jonathan, I like the way you are quietly sitting at your desk with your journal out. This shows me you are ready to learn.”). Setting clear expectations for students in the classroom enhances engagement and decreases off-task behaviors, as students understand what exactly is expected. Similarly, when teachers use specific academic praise, they provide feedback to all students on why an answer is correct (e.g., “That’s right, Maria. This shape is a triangle. We know it’s a triangle because there are three sides and three

vertices.”).

In an intervention study of three preservice teachers’ use of specific praise, the largest gains were observed after participants had received performance feedback on their practice sessions (Simonsen et al., 2010). Findings highlight the importance of including aspects of feedback when preparing teachers to use specific praise. The present study extends this work by looking at behavior and academic praise both jointly and individually, investigating the effectiveness of performance feedback delivery models, and allowing participants to acquire new skills through deliberate practice within a mixed reality environment (e.g., avatars).

Providing Performance Feedback to Preservice Teachers

There is an emerging body of literature that urges teacher educators to examine the way we prepare preservice teachers (Leko et al., 2015; Schles & Robertson, 2019; Sutherland et al., 2003). High quality teacher preparation programs provide numerous opportunities for purposeful practice, meaningful performance feedback, and targeted coursework (Scheeler, Budin, & Markelz, 2016). Furthermore, it is important that teacher preparation programs introduced EBPs and provide preservice teachers the time and space to practice and receive performance feedback on how they are implementing these strategies (Schles & Robertson, 2019).

Performance feedback is a systematic way to provide feedback to novice teachers as they learn and acquire new instructional skills (Noell et al., 2000, 2002; Rathel, Drasgow, & Christle, 2008). Performance feedback should include four components: review of data, corrective feedback, praise for correct implementation, and addressing any preservice teachers’ questions or concerns (Coddling et al., 2005). Studies have indicated that preservice teachers who receive performance feedback have shown an increase in the use of the targeted skill or strategy (Coddling et al., 2005; Noell et al., 2002; Rathel, Drasgow, & Christle, 2008).

Simulators are beneficial to use in teacher preparation programs as they allow preservice teachers to couple pedagogical content from their coursework with deliberate practice in a

safe and controlled environment. This setting allows for explicit classroom instruction that exposes preservice teachers to a range of classroom conditions and behaviors (Simonsen et al., 2008). Further, simulators provide an opportunity for preservice teachers to experience challenging behaviors while delivering instruction and receive timely performance feedback.

An important aspect noted in the abovementioned studies is the use of performance feedback to increase preservice teacher use of specific praise. Scheelar (2008) stated that providing performance feedback promotes learning a new skill and the ability to transfer that newly acquired skills into the actual classroom. Cavanaugh’s (2013) review of performance feedback indicated that it is an effective coaching technique to improve teachers’ use of specific praise in the classroom. The literature also suggests the use of performance feedback is an effective approach to improve both preservice and inservice teachers’ use of specific praise (Akalin & Sucuoglu, 2015; Duchaine, Jolivette, & Fredrick, 2011).

Using Mixed-Reality Simulations for Deliberate Practice

Deliberate practice is a phrase used to describe activities that are designed to improve preservice and inservice teachers’ practice. Deliberate practice activities are based on five principles: 1) push beyond one’s comfort zone; 2) work toward well-defined, specific goals; 3) focus intently on practice activities; 4) receive and respond to high quality feedback; and 5) develop a mental model of expertise (Deans for Impact, 2016). These principles are based on research from across a wide range of fields and have been shown to improve teacher performance.

Teacher preparation programs often struggle to find appropriate placements which provide preservice teachers the opportunity for deliberate practice. A growing response to this challenge is the use of simulated environments (i.e., virtual and mixed-reality) to provide more realistic practice opportunities. The use of simulations is a well-validated approach for candidates in fields outside of education such as military and

medical training (McGaghie et al., 2010). Simulations allow individuals to learn and master new skills in an environment that does not put others at risk (Dieker et al., 2014). Simulated environments enable teachers to practice decision-making and receive feedback through virtual responses and peer observers (Brown, 2000).

There are a few mixed-reality operating systems on the market that have been used with preservice teachers. TLE TeachLive™ is one such simulator system which uses avatars puppeteered by a simulation specialist. Mixed-reality simulation provides preservice teachers an opportunity to develop their pedagogical content knowledge via a controlled instructional environment (e.g., controlling for learning or behavioral challenges).

TLE TeachLive™ is a simulated environment that transcends disciplines to allow many different fields to play with the simulations developed using the underpinning code. The system currently uses either student or parent/teacher avatars that were created using 3-D modeling and computer animation techniques. The resulting avatars are controlled by artificial intelligence and a human operator who embodies the avatars. The avatars look, talk, and interact like typical humans and provide a safe and effective playground for teachers, administrators and parents to experience the environment (Dieker, Hynes, Hughes, Hardin, & Becht, 2015, p. 12).

Although simulation research is limited, preliminary research shows that teachers who participated in four 10-minute simulation sessions demonstrated positive changes in their teacher behaviors and were able to translate the targeted skill to the classroom (Hynes, Hughes, & Straub, 2014). Furthermore, an increase in student achievement outcomes was observed for participants. Given that preservice teachers need deliberate practice along with expert feedback to develop effective classroom practice, mixed-reality classroom simulation is a promising approach for teacher preparation programs (Leko et al., 2015).

Judge et al. (2013) investigated the effects of a mixed-reality simulator on six preservice

teachers' use of differential reinforcement of incompatible behavior in a simulated classroom. Differential reinforcement includes decreasing undesirable classroom behaviors while reinforcing desirable behaviors through verbal prompting, precise praise, and planned ignoring. Participants were assigned to one of three conditions: a) video-training only; b) video-training followed by email feedback from instructor, followed by peer group feedback; and c) video-training followed by peer group feedback then email feedback. Findings indicated an increase in the use of specific praise to increase student engagement. Participants found the peer group feedback more helpful than the email feedback.

Purpose of Present Study

The purpose of this pilot study is to explore if and how performance feedback affected preservice teacher understanding and use of the targeted HLPs within a simulated environment. We were interested in measuring the effects of instruction that included both online instructional HLP modules, mixed-reality simulation sessions, and if and how performance feedback (i.e., peer vs. instructor feedback) affected preservice teachers' understanding and use of the target HLPs in the simulated sessions. Specifically, our research questions were:

1. Are there differences in preservice teachers' understanding of and belief in their ability to implement HLPs based on the type of performance feedback they received: instructor, peer, or control?
2. Are there differences in HLP implementation between the groups based on the type of performance feedback they received: instructor, peer, or control?

Methods

Participants and Setting

This study took place in a large southeastern university. Participants originally consisted of fifteen undergraduate general education majors who were recruited through a college-wide listserv email. The email invite was sent to preservice teachers who were enrolled in a three-credit hour course focused on students with disabilities, as required for all general education

majors in this state. Of the 15 participants who consented to the study, two elected not to participate once the intervention began, bringing the total number of participants to 13. Although the participants were not in the same section of the course, they all had the same instructor and covered the same content. The content of the course focused on the legislative mandates for serving exceptional students, characteristics of exceptionality, and best practices in facilitating teaching and learning. At the time of the study, the preservice participants had only observed professionals in a classroom setting; they did not have any teaching experience.

Table 1
Participants Information

	Gender	Degree
Instructor (N=5)	Male (N=3)	Elementary Ed (N=1)
	Female (N=2)	Secondary (N=4)
Peer (N=3)	Male (N=1)	Elementary Ed (N=2)
	Female (N=2)	Secondary (N=1)
Control (N=3)	Male (N=1)	Elementary Ed (N=2)
	Female (N=2)	Secondary (N=1)

Measures

In order to measure preservice teachers' understanding of and belief in their ability to implement HLPs and their perceptions of their classroom management skills, behavior strategies, instructional strategies, and use of specific praise, a pre/post survey was given. Each participant was given an ID number so the surveys contained no identifiable information. The survey was designed using a Likert-type scale ranging from 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neither agree or disagree, 4 = agree, 5 = strongly agree). The pre-survey was administered during the second week of courses, before any instructional modules or simulator sessions occurred. The post-survey was administered at the end of the study. The survey contained 28 statements focusing on the

following five domains: 1) preservice teachers' perceptions of their classroom management, 2) preservice teachers' perceptions of their use of behavioral strategies, 3) preservice teachers' perceptions of their use of instructional strategies, 4) preservice teachers' perceptions of their use of praise, and 5) preservice teachers' perceptions of their use of modeling.

To measure preservice teacher implementation of HLPs, each simulator sessions was recorded and coded for the presence or absence of behavior specific praise, academic specific praise, and teacher modeling.

Research Design

An experimental design was used to investigate the effects of performance feedback on preservice teacher behaviors while engaging in mixed-reality simulator (e.g., TLE TeachLive™) sessions. Use of the mixed-reality simulator provided the opportunity for participants to deliberately practice the HLPs and EBPs in a controlled instructional environment.

Procedure

During the first week of classes, participants were provided an overview of the study. Upon receipt of consent to take part in the study, participants were asked to complete a survey of their perceptions of the HLPs and EBPs. The areas covered in the survey included classroom management skills, behavior strategies, instructional strategies, use of praise (academic and behavior), and use of modeling.

The thirteen participants were randomly assigned to three conditions to determine if and how performance feedback influenced their use of HLPs and EBPs in the simulator. The three groups were identified as follows: a) Instructor Feedback Group (N=5), b) Comparison Peer Feedback Group (N=3), and c) Control Group (i.e., no feedback; N=3).

All participants met twice a week for their three-credit hour course on students with disabilities. At the beginning of the week, the instructor of record was asked to present the online instructional modules and pass out the guided notes during class time. Once the online modules and guided notes were completed, the preservice teacher participants were given a specific time to come to the simulation and teach

their scripted lesson to the student avatars. Once the designated feedback was given (i.e., instructor, peer, or none) the participant self-reflected on the experience. This cycle of instructional modules and five simulated practices continued for seven weeks. After each group completed its last simulated session, they completed the posttest on their perceptions of the HLPs focusing on the EBPs. Responses pertained to classroom management skills, behavior strategies, instructional strategies, and use of praise.

Online instructional modules. All participants were asked to watch and complete seven online instructional modules which presented information on the targeted HLPs. These modules consisted of recorded lectures with guided notes. The guided notes were modified versions of the online modules with blank spaces for key concepts, facts, and activities (Austin, Lee, & Carr, 2004). The purpose of the guided notes for this study was to promote deliberate practice and active engagement, and to connect the module content to their simulated sessions and scripted lesson plans.

All modules followed the same format, were 8-10 minutes in length, and were embedded throughout the seven-week study for deliberate practice. Each module began with operationally defining a targeted EBPs (i.e., academic specific praise, behavior specific praise, or modeling). The guided notes activities would prompt the students to think about their scripted lesson and encourage them to embed the targeted HLPs and EBPs within that lesson. The first two online instructional modules focused on the HLPs *Providing Oral and Written Feedback to Students* and *Specifying and Reinforcing Productive Student Behavior*. These modules emphasized the importance of using the EBPs of specific academic and behavioral praise. The last three modules centered around the HLP *Explaining and Modeling Content, Practices, and Strategies*.

Literature on behavior specific praise defines it as positive verbal feedback of a desirable social and/or academic behavior, placing the constructs of behavior and academics within the same definition (Villeda et

al., 2014). The instructional modules explicitly taught behavioral praise and academic praise as two separate terms. Preservice teachers were taught that, in order for a behavior and academic-specific praise statement to be most effective, it needed three components. It needed to be individualized, occur immediately after the desired behavior, and focus on student's improvement and/or effort (Allday et al., 2012; Conroy et al., 2009).

Modules focusing on teacher modeling operationally defined the construct of modeling, provided teachers with tips for how to model effectively (i.e., make it highly detailed), and provided the videos of teachers modeling in the classroom.

Each module would introduce or review a specific EBP. Each EBP definition was based on the literature and was explicitly defined in the online modules. The EBPs were defined as follows:

- **Behavior specific praise** statements were defined as positively phrased audible statements that conveyed an explicit reference to a desired behavior. For example, when students prepare to line up for lunch a teacher might say, "I like the way Sean is walking quietly to the door."
- **Academic specific praise** statements were defined as positively phrased audible statements that conveyed an explicit reference to a desired academic behavior. For example, after a student completes a writing essay during language arts class, a teacher could say, "You wrote great supporting sentences in your essay, Maria. The level of detail and descriptive language you used really help the reader visualize your words."
- **Teacher modeling** was defined as an evidence-based instructional strategy in which skills were explicitly explained and demonstrated (Archer & Hughes, 2011). For example, a teacher doing a "think aloud," explicating demonstrating step-by-step how good readers monitor their understanding by looking for context clues.

First the participants watched an online

module and complete the accompanying guided notes. Then they entered the simulation, where they taught a scripted lesson after which they received feedback immediately.

TeachLive™ was used for simulator sessions. TeachLive™ is a virtual reality simulation platform that allows preservice and inservice teachers to practice novel teaching strategies or content with five student avatars. Because participants had never taught in a classroom before, each was provided the same scripted lesson plan to use during their simulator sessions. This allowed the preservice teachers to focus on deliberate practice of the three targeted EBPs rather than focus on content.

Performance Feedback was then given. After each deliberate practice within the simulation, the participants in the Instructor and Peer Feedback groups would receive immediate feedback on their time in the simulation.

Instructor feedback was also provided. Participants in the instructor feedback group taught six simulator sessions with only the principle investigator and a graduate assistant recording the session in the room. Each preservice teacher received one-on-one performance feedback from the instructor immediately following his or her lesson. Examples of instructor feedback statements included, “You did a nice job of modeling the rules at the beginning of your lesson” and/or “You said ‘*great job*’ often. Another way to add an academic praise would be to repeat a student’s answer and expand on it.”

Preservice teachers that were assigned to the peer feedback group had the opportunity to watch their peers’ simulator sessions and provided them with feedback immediately following their lessons. Examples of peer feedback statements included, “You did move around a lot,” “You were very engaging,” and/or “You tried to use specific praise a lot.” The control group (preservice teacher participants) taught the scripted lesson in front of their peers within the simulation, but no feedback was given.

Data Collection

Data consisted of instructional videos of the participants delivering their lessons, pre-/post-surveys, and reflection surveys consisting of

Likert responses and two open ended questions: 1) What do you feel went well during the session? and 2) What do you think you could improve on?

Data Analysis

A 2x3 analysis of variance (ANOVA) was used to investigate the time point (i.e., pre- and post-test) and the effects of type of feedback (i.e., instructor, peer, or none) on preservice teachers’ understanding of and belief in their ability to implement HLPs. Normality was supported by the Shapiro-Wilk test for each of the three treatment combinations (all p 's > 0.05/3). Although the sample size does not lend itself to inferential statistics, a number of results merit consideration.

Videotapes of each participants’ simulator sessions were viewed and analyzed by two graduate research assistants (GRA). The GRAs recorded if the participants displayed the three dependent variables (i.e., academic specific praise, behavioral specific praise, or modeling) onto a coding sheet. Before coding could begin, the GRAs had to meet a training criterion (i.e., 80% interobserver agreement on four consecutive pilot study videos). Once training criterion was met, the videos were divided between the GRAs and 33% of the videos were coded by both GRAs to confirm rate of agreement. The average inter-rater reliability across 33% of sessions was 89%. Inter-rater reliability was determined by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Once the data were collected, it was then converted to rate. This conversion allowed the behavior counts to be a constant scale due to the variance in observation time that was encountered.

Results

Results for Pre/Post Survey

To investigate our first research question, we conducted a 2 x 3 analysis of variance (ANOVA) to investigate the effects of type of feedback on participants’ pre- and post-test scores. Results of this analysis revealed a statistically significant main effect between feedback type and time point (i.e., pre- and posttest); $F(1,4) = 624.913, p < 0.001, \omega^2 = 0.98$. A follow up one-way ANOVA revealed a

significant difference for the instructor feedback group; $F(1,8) = 21.259, p = 0.002$. Significant effects were not present for the peer feedback ($p = 0.589$) nor the control group (i.e., no feedback; $p = 0.285$).

Results for Preservice Teachers Use of EBPs in the Simulator

To investigate our second research question, we analyzed the recorded videos of preservice teacher behaviors from the simulations. Specifically, we coded behaviors per minute of specific academic praise, specific behavior praise, and teacher modeling to understand if and how feedback influenced preservice teacher implementation of the HLPs. We present the means of the first and last simulator session for each feedback group in Table 2.

Table 2
Observed HLP Mean Rate per Minute by Feedback Group

	Academic Praise	Behavior Praise	Modeling
Instructor Pre	0.30	0.18	0.00
Instructor Post	0.35	0.25	0.00
Peer Pre	0.13	0.03	0.00
Peer Post	0.49	0.14	0.00
Control Pre	0.20	0.30	0.00
Control Post	0.29	0.25	0.00

Descriptive statistics indicate that preservice teacher use of specific academic praise increased across all three feedback groups. The mean rate per minute of specific behavioral praise increased for the instructor and peer feedback group and decreased for the control group. Interestingly, teacher modeling was not observed during the first or last simulation for participants in any of the three groups.

Discussion

In this pilot study, it is suggested that

the use of deliberate practice within a simulation and performance feedback played a role in the increased use and efficacy of high leverage practices in preservice teachers. All preservice teachers that were in the instructor feedback group and peer feedback group showed an increase in the rate in which they used HLPs in the simulation. This is unlike the control group, as only two out of the four preservice teachers showed slight increases in their use of HLPs during simulation time. In addition, the instructor feedback group’s efficacy of HLPs showed a significant shift between pre- and post-test, while the control group and peer feedback group did not. This demonstrated the possible impact that simulation plus instructor performance feedback can have on preservice educators’ teaching behaviors. The results of this study align with the emerging literature on how performance feedback can influence preservice teachers’ use of effective behaviors and the importance of embedding purposeful practice of HLPs in teacher preparation programs (Leko et al., 2015; Noell et al. 2000, 2002; Rathel, Drasgow, & Christle, 2008; Sutherland et al., 2003).

Control Group

Preservice teachers in the control group were in the simulator five times and did not receive any feedback from their peers or instructor. The lack of feedback could be the reason this group did not have significant gains in either their efficacy of HLPs or their use of HLPs within the simulation sessions. Between the first and last sessions, participants did show a slight increase in the mean rate per minute of the academic praise behavior (.09). A decreased in their use of behavioral specific praise was seen (-.05) and modeling was not seen at all during the simulation sessions. It is believed that when preservice teachers receive timely feedback, they are more likely to implement the feedback they received (Rathel et. al., 2008). Another interesting fact to consider is that this group taught their lesson in front of their peers with no explicit feedback from anyone. Nerves and lack of affirmation could have contributed to their subpar performance within the simulation.

Peer Feedback Group

Preservice teachers within the peer feedback

group were also in the simulation five times and received feedback from their peers only. Mean rate per minute gains were seen in the behaviors of specific academic (.36) and specific behavioral praise (.11). Modeling was not seen in any of the sessions. Although all preservice teachers in this group showed an increase in their use of HLPs within the simulation, gains were not seen in their efficacy of those HLPs. One factor could be that peers were not explicitly instructed on how to provide performance feedback. Overall, feedback that peers gave and received was general and nonspecific. Some examples of feedback participants received were: “Good job during your lesson,” “Nice job,” and “I liked your lesson.” Performance feedback should have components of corrective feedback, praise for correct implementation of strategy, and should address any comments or questions the preservice teacher may have (Coddling et al., 2005). For future study, it is suggested that preservice teachers be explicitly taught how to give performance feedback. This could include the use of sentence stems to prompt students to focus on specific attributes of HLPs. Like the control group, participants taught their lessons in front of their peers and instructor. Performing in front of their peers and/or lack of explicit performance feedback could be contributing factors as to why efficacy of HLPs were not as impactful as the instructor feedback group.

Instructor Feedback Group

Preservice teachers in the instructor feedback group showed the highest increase in their efficacy and use of HLPs. Preservice teachers received immediate feedback on their performance in the simulation from the researcher on their use of HLPs. Performance feedback included corrective feedback, praise for correct implementation of the HLPs, and additional feedback, and addressed any comments/concerns that the preservice teachers may have had. Some examples of the feedback participants received were: “You used a lot of general praise when you were going over the list of vocabulary words. Tell me two ways you could have used academic praise during that time?” “Great use of modeling when thinking about the science word,” and “Great use of

behavioral specific praise when talking to CJ.”

Preservice teachers in this group taught their scripted lessons in front of the PI. This group showed the most gains in their efficacy ($p = 0.002$) of HLPs. The gains in mean rate per minute of academic specific praise and behavioral specific praise between the first and last session were .05 and .07 respectfully. Although participants in this study were randomly assigned to groups, the instructor feedback group started the initial simulation session exhibiting higher rates per minute than the peer group. Thus, the gains were not as great as they were for the peer feedback group.

Preservice teachers in this group could have felt more comfortable teaching in front of just the PI rather than their peers. Future research warrants examining how performance in simulation differs when participants teach in front of peers, instructor only, or without any observers.

Limitations and Future Direction

It should be noted that there are several limitations to this study that should be considered when interpreting the results. First is the small sample size. Further research should examine the effects of performance feedback and mixed-reality simulation on a larger sample size and across content areas. Second, although preservice teachers were asked to keep discussions and experiences they had in the simulation private, it is not guaranteed that participants followed instructions. Talking to each other outside the simulation time could have influenced their behaviors within the simulation. Another limitation of this study is that not all preservice teachers engaged in the same amount of simulation practice due to a variety of reasons (i.e., sick, job). Future studies should examine if the amount of simulation time a preservice teacher participates in impacts their efficacy and use of HLPs. The last limitation to consider would be that the three groups did not receive the modeling online module until week three of the study. Therefore, students may not have had enough time to process and practice this EBP within the simulator, thus the lower rate of use for this teacher behavior.

Conclusion

This pilot study contributes to the literature

by examining the use of performance feedback in the deliberate practice of HLPs in teacher preparation. The results of this study suggest that pairing the use of mixed-reality simulation with instructor performance feedback in the deliberate practice of HLPs is a promising way for preservice teachers to hone their craft before entering a classroom. It is important that teacher preparation programs take the time to explain the importance of, provide the opportunity to practice, and give meaningful performance feedback of these strategies. When a teacher enters a classroom prepared with the knowledge and skills of HLPs, students are more likely to engage with the content and succeed.

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