THE USE OF MIXED-REALITY SIMULATIONS AS A TOOL FOR PREPARATING PRE-SERVICE TEACHERS AND THEIR PERCEPTIONS AND OPINIONS

USO DE SIMULACION DE REALIDAD-MIXTA COMO HERRAMIENTA EN LA FORMACIÓN DE MAESTROS: PERCEPCIONES Y OPINIONES

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Exposure to technologies such as mixed-reality simulations (MRS) can influence the opinions of pre-service elementary teachers (PSET), as well as the way they see and perceive MRSs as a useful experience in their preparation. Particularly, in the implementation high-leverage practices. The study presented here was carried out in a course of mathematical methods for elementary. The research questions are: What are the PSETs perceptions of the use of MRS as part of their teaching preparation? What are the views of PSET on MRSs as a tool to improve their teaching skills? Results indicate that PSET perceive MRSs as a highly positive, relevant and meaningful tool that supports their learning, as well as a way to improve their high-leverage skills.

Key Words: Technology, Teachers belief, Pre-service teacher preparation.

Introduction

The perception, views, and opinions of pre-service elementary teachers (PSET) regarding their acquisition of teaching skills can be influenced by the integration of technology in their teacher preparation program. Perceptions change when these technologies are linked to practice and are recognized as having several benefits (Gordon, Brayshaw and Gray, 2015; Russell, Bebell, O'Dwyer & O'Connor, 2003). Specifically, we refer to the use of emerging technologies such as Mixed-Reality Simulations (MRS), which are tools intended –but not limited– to provide simulated experiences to pre-service teachers. Engaging with mixed-reality simulations take place in a controlled and safe environment, which has the potential to improve and strengthen teaching skills (Hixon & So, 2009).

This report presents the perceptions, opinions, and points of view of Pre-service Elementary Teachers regarding the utility, benefits, and challenges of using mixed-reality simulations, as part of the teacher training program. Pre-service elementary teachers were exposed to the use of MRSs in an elementary mathematics methods course. The use of MRSs with PSETs was intended to foster high-leverage practices (Ball & Forzani, 2011) such as productive mathematics talk moves (Chapin, O'Connor & Anderson, 2009; Moyer & Milewicz, 2002; Ginsburg, 1997). These productive teaching moves include eliciting, evaluating, and questioning elementary students as they share and explain their solutions to problem solving activities in mathematics. To this end, the following research questions are addressed: What are the perceptions and ideas of pre-service elementary teachers regarding the use of mixed-reality simulations as part of the teacher preparation program? What are the opinions of pre-service elementary teachers on mixed-reality simulations as a tool used to improve their teaching skills, particularly those related to productive mathematical talk move?

Theoretical Perspectives

Insights on The Use of Technology

In order for pre-service teachers have the theoretical understanding of the benefits of being exposed to the use of technologies such as mixed-reality simulations, their perceptions and opinions regarding the usefulness of this must be framed in what Venkatesh, Morris, Davis and Davis (2003) have called

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the theory of acceptance and perception of the use and exposure to technology. According to Venkatesh et al., the perception that PSETs have about the benefits and utility of the use of technologies can be influenced by their experiences with it in their preparation programs. Venkatesh et al. adopted Davis's (1989) definition of utility as the measure by which an individual believes or perceives that the use of a particular technology (e.g., Mixed-Reality Simulations) improves the work being done, in which case, for the PSETs and the purpose of this study, would be the learning process and the teaching skills fostered through high-leverages practices such as productive mathematics talk moves in problem solving where one seek to elicit and understand a student's thought.

Mixed-Reality Simulations and Teaching Strategies

Mixed-Reality simulations were implemented in the context of a course on mathematics methods for elementary school. High-leverage strategies were integrated into this course (Ball and Forzani, 2011). According to Ball and Forzani, these strategies, are pedagogical skills that directly impact the student's academic performance and that can be implemented at various school levels in a high number of subjects or context. Some of these pedagogical strategies include how to promote an active participation from students, provide positive feedback, how to reveal, understand, and interpret the students' thoughts and ideas through productive mathematical talk moves (Chapin, O'Connor & Anderson, 2009), among others. According to Chapin, O'Connor & Anderson, productive mathematical talk moves (PMTM) refer to all those actions that teachers must carry out during teaching (including moments of group discussion or during an exchange of ideas between a teacher and a student) to better understand the ideas and understandings of the students. Some PMTMs, for example, include asking a student to repeat another student's idea in their own words, or asking a student to go deeper in their explanations, or simply remaining silent to listen to what a student is saying. During mixed-reality simulation sessions, the pre-service teacher practiced how to implement the pedagogical strategies mentioned above. Similarly, Pre-service teachers were able to experience what they could potentially expect when interacting with real students.

What are Mixed-Reality Simulations?

New technologies in education are now implemented to improve the process of teaching and learning. However, little has been done to integrate and expose Pre-service elementary teachers to emerging technologies such as *Mursion*, which are simulation technologies that allow a pre-service teachers to have "repeated practices involving high-risk situations without necessarily risking the loss of valuable resources" (Dieker et al., 2014, p.22).

Mursion is a mixed-reality simulation software where students are avatars and a virtual classroom is simulated. The pre-service elementary teacher has the opportunity to experience situations related to teaching. During a simulation session, a pre-service elementary teacher sees students or avatars in a classroom through a computer–or device– screen. The pre-service elementary teacher initiates the interaction with these avatars in the same way as it would in a classroom. In MRSs, the avatars are controlled by an educational trained specialist. The pre-service teachers are actually in a semi-controlled, structured, and prepared interaction with a specialist. The specialist controls the avatar, and not a computer program as in virtual reality, which allows for greater flexibility to offer the various classroom situations, both expected and unexpected similar to those that occur in a real classroom with a sense of reality in which there is a "real presence", defined by Dieker et al. (2015) as the perception that something real is happening.

Methods

Approximately 166 pre-service elementary teachers have taken the mathematics methods course since fall 2018, of which 92% were women and 8% men. Participants were in their first or second year of the preparation program. All pre-service elementary teachers were required to conduct an

interview with an elementary student and assess their understanding when solving a series of mathematics problems. To this end, pre-service elementary teachers were exposed to theories on problem solving. During the course, the PSETs were prepared by analyzing teaching videos, rehearsing play roles as student/teacher, and experiencing three MRS sessions. Each MRS session lasted between 7 and 12 minutes and were video recorded. Each session required the PSETs to implement a different problem. The problems were selected by the researchers following the theoretical framework of cognitive guided instruction problems (Carpenter, Fennema, Franke, Levi & Empson, 2014). MRSs sessions were scheduled three times during the semester to ensure that the theoretical and pedagogical concepts discussed in class were acquired. At the end of the semester, pre-service teachers were asked to complete a survey to measure their perceptions, views, and opinions about the use of mixed-reality simulations.

Instrument

The instrument was developed using items from Hudson, Voytecki and Zhang, (2018), Bousfield, (2017) and Rasimah, Ahmad and Zaman (2011), and adapted for the purposes of the research. The survey consisted of 27 questions with a scale ranging from 1 to 5, where one means completely agree, to a five strongly disagree (see appendix A). Additionally, 4 open-ended questions were included to capture the opinions of the PSETs on what was most positive or negative about the experience with MRSs, the challenges they had while rehearsing with MRSs, and their perceptions of the benefits of being able to be prepared with the use of mixed reality simulations.

Results and Discussion

The implementation of MRSs allows pre-service teachers to participate in virtual classroom environments that simulate real classrooms. In this sense, 94% of participants agree or totally agree that the MRSs simulated a very similar and real experience as classroom, and 97% expressed that they see the practices with the MRS as a very positive experience. For example, participants mentioned that MRSs "provides unexpected experiences that I had to deal with, and help me feel better prepared for the real-world "; "How the avatar speaks and acts, seems like a real children, especially with their responses"; "I liked being able to practice as if it were a real classroom"; "I was able to practice as if I was really in front of the classroom with real students."

The use of MRSs in a teacher preparation program is not intended to displace the actual experience, but rather to enhance the preparation experiences (Peterson-Ahmad, 2018), in a protected, semi-controlled and safe environment (Hatton, Birchfield and Megowan-Romanowicz, 2008). Participants in the study acknowledge the above, for which 97% agree or fully agree that the use of MRSs is an effective way to practice new skills in the classroom, particularly in mathematics, of which 94 and 97%, respectively, expressed feeling more confident and better prepared to teach mathematics effectively or to engage their students in topics that involve discussions of problem solving activities, as they mentioned: "What I liked about the MRSs is that I was able to practice math problems as if I was really teaching it to real students." In this same sense, 88% of the pre-service elementary teachers agree or totally agree that after having been exposed and practiced with MRSs, they feel better prepared to carry out an interview with an elementary student on mathematics topics, where they should evaluate and verify the ideas, thoughts, and understandings using PMTMs.

Pre-service elementary teachers recognized the benefits of been exposed to a cutting-edge technology that is used as an educational tool to improve, enhance, and facilitate the acquisition of educational practices such as high-leverage practices. Several participants mentioned that the experience with MRS “allowed [them] to get the necessary practice before finishing the program and teach real students." Finally, one of the most received opinions by the participants, was that they wish they had the opportunity to have more time to interact with MRSs.

Conclusions

The way in which teachers are prepared is significant, since it is during these times when they acquire the skills and knowledge necessary for their future work as teachers (Vagi, Pivovarova and Miedel Barnard, 2019). Then, its relevant to report the findings of this study, so that other teacher preparation programs know the benefits and potential of integrating emerging technologies such as Mixed-Reality Simulation in their courses and improve the teaching skills of their teachers, since the first day of the program. As shown in the previous section, the perceptions and opinions of the pre-service elementary teacher on the usefulness of MRS are very positive, which would facilitate their integration. Similarly, when the integration of MRSs is seen as positive, efforts and resources allocated to implement simulations would be justified. The use of MRSs in a teacher preparation program, particularly in a math method course, as it was done here, is an innovative way to improve the acquisition of teaching skills by pre-service elementary teachers. During this first phase of the study, it is shown that participants perceive MRS as a useful tool, that helped them improve their teaching skills — particularly with regard to eliciting and questioning students in a classroom or as a teacher-student interview. The well-structured, guided, and planned use of MRSs technologies (Venkatesh et al., 2003) helped the pre-service elementary teacher perceive MRS as a tool intended to improve their pedagogical teaching skills (Ball & Forzani, 2011), and not to replace the real experience, which is a common limitation during the first years in preparation programs.

The results presented here are only the first phase of a larger study that involves analyzing the transcripts of the pre-service elementary teacher after they have interviewed an elementary school student. The results of this study will be analyzed, contrasted and presented in another report in this same forum, meanwhile, more data will continue to be collected on the perceptions, points of view and opinions on the use of mixed-reality simulations in a teacher preparation program.

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APPENDIX A

1. I like to experience with new technologies.
2. I enjoy rehearsing with Mixed-Reality Simulations.
3. I was unhappy when the Mixed-Reality Simulations sessions were over.
4. I would like to repeat the same experience using Mixed-Reality Simulations.
5. I feel that using Mixed-Reality Simulations enhanced my learning experience.
6. I feel better prepared to teach after my Mixed-Reality Simulation session.
7. Using the Mixed-Reality Simulation is an effective way to practice new classroom skills.
8. My Mixed-Reality Simulation session seemed like a real classroom experience.
9. The Mixed-Reality Simulation's students seemed like real elementary students.
10. After practicing my teaching methods using Mixed-Reality Simulations, I am more confident that I can effectively teach mathematics concepts.
11. After the MRS, I feel prepared to conduct a clinical interview to assess and elicit students thoughts and understanding using mathematics productive talk moves.
12. After my Mixed-Reality Simulation sessions, I have more confidence that I can engage students in a discourse about problem-solving activities.
13. I was able to effectively manage the interview during my Mixed-Reality Simulation sessions.

14. After the Mixed-Reality Simulation rehearsal, I feel prepared to orchestrate a group discussion in a classroom to assess understanding using mathematics productive talk moves.
15. After Rehearsing with the Mixed-Reality Simulations, I felt my Clinical interview with an elementary student was conducted effectively.
16. After the Mixed-Reality Simulation sessions, I have more confidence in my ability to manage undesired behaviors in group discussion.
17. After my Mixed-Reality Simulation sessions, I am better prepared to teach lessons involving problem solving.
18. I felt the Mixed-Reality Simulation's interviews were conducted effectively.
19. I felt like I was in a real classroom during the sessions.
20. The Mixed-Reality Simulation sessions prepared me to conduct the clinical interview.
21. The Mixed-Reality Simulation rehearsals helped me to create a plan for the clinical interview with an elementary student.
22. My experience with Mixed-Reality Simulations prepared me to teach.
23. I would like to use Mixed-Reality Simulation to develop my teaching skills in other courses.
24. Reflecting after each Mixed-Reality Simulation helped me to be better prepared for the next rehearsal.
25. Receiving peer feedback after each Mixed-Reality Simulation helped me to reflect on my strengths and weakness in assessing a students' understanding.
26. Receiving peer feedback after each Mixed-Reality Simulation helped me to reflect on my strengths and weakness in conducting a clinical interview.
27. Providing feedback to my peers after each Mixed-Reality Simulation helped me to reflect in my own teaching skills.

Open-Ended questions

1. What did you like the most about the Mixed-Reality Simulation?
2. What did you dislike the most about Mixed-Reality Simulation?
3. What do you consider was the most challenging aspect of interacting in with Mixed-Reality Simulations?
4. Do you believe using Mixed-Reality Simulation was beneficial for your Teacher-Preparation? If yes, why? if not, why?

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La exposición a tecnologías como simulaciones de realidad mixta (SRM) puede influenciar las opiniones de los maestros de primaria en formación (MPF), así como la manera en la estos ven y perciben las SRM como un instrumento útil en su preparación docente. Particularmente, en la implementación de estrategias pedagógicas de enseñanza de alto apoyo académico (EPEAA). El estudio aquí presentado se llevo a cabo en un curso de métodos matemáticos para primaria. Las preguntas de investigación son: ¿Cuáles son las percepciones de los MPF sobre el uso de las SRM como parte de su preparación docente? ¿Cuáles son las opiniones de los MPF sobre las MRS como herramienta para mejorar sus habilidades de enseñanza? Resultados señalan que los MPF perciben las SRM como una herramienta altamente positiva, relevante y significativa que respalda sus aprendizajes, así como una forma de mejorar sus habilidades de EPEAA.

Palabras clave: Tecnología, Creencias de los docentes, Preparación de Maestros en Formación.

Introducción

La percepción, puntos de vista, y opiniones de los maestros de primaria en formación (MPF) sobre cómo la tecnología puede ayudarlos a adquirir nuevos conocimientos y habilidades de enseñanza, pueden verse influenciadas si estas tecnologías se integran como parte de sus programas de preparación. Especialmente, si estas tecnologías están vinculadas a la práctica y se presentan como un instrumento con múltiples beneficios (Gordon, Brayshaw y Gray, 2015; Russell, Bebell, O'Dwyer y O'Connor, 2003). De forma específica, nos referimos al uso de tecnologías emergentes como las simulaciones de realidad mixta (Mixed-Reality Simulations en inglés). Los softwares de simulación de realidad mixta (SRM), son herramientas destinadas a proporcionar a los maestros de primaria en formación experiencias simuladas. Estas experiencias ocurren en un ambiente controlado y seguro, que busca mejorar y fortalecer las habilidades de enseñanza (Hixon & So, 2009).

El reporte que se presenta en esta propuesta muestra cuáles son las percepciones, opiniones y puntos de vista de los maestros de primaria en formación con respecto a la utilidad, beneficios y retos de utilizar simulaciones de realidad mixta, como parte del programa de formación docente. El uso de SRM con los maestros de primaria en formación tuvo la intención de fomentar estrategias pedagógicas de enseñanza de alto apoyo académico (Ball y Forzani, 2011) como los movimientos productivos de conversación matemática (Chapin, O'Connor y Anderson, 2009; Moyer y Milewicz, 2002; Ginsburg, 1997) para obtener, evaluar y cuestionar a los estudiantes mientras comparten y explican sus soluciones a actividades de resolución de problemas en matemáticas. Con este fin, se buscaron responder las siguientes preguntas de investigación: ¿Cuáles son las percepciones e ideas de los MPF sobre el uso de las simulaciones de realidad mixta como parte del programa de formación docente? ¿Cuáles son las opiniones de los MPF sobre las simulaciones de realidad mixta como una herramienta utilizada para mejorar sus habilidades de enseñanza, particularmente las relacionadas a los movimientos productivos de conversación matemática?

Marco Teórico

Perspectivas sobre el uso de la tecnología

Hoy en día, para que los MPF realmente tengan una comprensión teórica de los beneficios de ser expuestos al uso de tecnologías como las simulaciones de realidad mixta, sus percepciones y opiniones con respecto a la utilidad de esta se deben enmarcar en lo que Venkatesh, Morris, Davis y Davis (2003) han llamado la teoría de la aceptación y percepción del uso y la exposición a la tecnología. Según Venkatesh et al., la percepción que tienen los maestros en formación sobre los beneficios y la utilidad del uso de tecnologías pueden mejorarse significativamente cuando se abordan adecuadamente en los programas de preparación. Venkatesh et al. adoptó la definición de utilidad (Davis, 1989) como la medida por la cual un individuo cree o percibe que el uso de una tecnología en particular (p. ej., Simulaciones de Realidad Mixta) mejora el trabajo que se realiza, en cuyo caso — para los maestros de primaria en formación y el propósito de este estudio, sería el proceso de aprendizaje y las habilidades de enseñanza fomentadas a través de estrategias pedagógicas de enseñanza de alto apoyo académico como los movimientos productivos de conversación matemática (MPCM) en la resolución de problemas donde se busque entender y comprender el pensamiento del estudiante.

Estrategias de enseñanza y su relación con las Simulaciones de Realidad Mixta

Las SRM se implementaron en el contexto de un curso de métodos matemáticos para MPF. En este curso se integraron estrategias pedagógicas de enseñanza de alto apoyo académico (Ball y Forzani, 2011). Según Ball y Forzani, estas estrategias, mejor conocidas en inglés como *High-Leverage Practices*, son habilidades pedagógicas que impactan directamente el rendimiento académico del estudiante y que pueden ser implementadas en diversos niveles escolares en un alto número de

materias o contenidos. Así mismo, son estrategias que se aprenden a través de la práctica docente y la retroalimentación oportuna y precisa. Algunas de estas estrategias pedagógicas incluyen el cómo tener una participación activa de los estudiantes, dar una retroalimentación positiva, como revelar, comprender e interpretar el pensamiento e ideas de los estudiantes a través de movimientos productivos de conversación matemática, entre otros. Los movimientos productivos de conversación matemática se refieren a todas aquellas acciones que debe llevar a cabo el maestro durante la enseñanza (incluyendo momentos de discusión grupal o durante un intercambio de ideas entre un maestro y un estudiante) para comprender mejor las ideas y entendimientos de los estudiantes acerca del tema que se está enseñando. Algunos MPCM, por ejemplo, incluyen pedir a un estudiante que repita la idea de otro compañero con sus propias palabras, o pedir a un estudiante que profundice en sus explicaciones, o simplemente guardar silencio para escuchar lo que está diciendo un estudiante.Durante las sesiones de SRM, los MPF practicaron como implementar las estrategias pedagógicas mencionadas anteriormente.

Simulaciones de Realidad Mixta

Hoy en día se implementan nuevas tecnologías en educación para mejorar el proceso de enseñanza y aprendizaje. Sin embargo, poco se ha hecho para integrar y exponer a los MPF a tecnologías emergentes como Mursion, que son tecnologías de simulaciones que permiten a los maestros en formación tener "prácticas repetidas que involucran situaciones de alto riesgo sin necesariamente arriesgar la pérdida de recursos valiosos" (Dieker et al., 2014, p.22). Mursion es un software de SRM en donde se simula que los estudiantes (comúnmente conocidos como avatar) están en un aula virtual. El MPF, consecuentemente, tiene la oportunidad de experimentar situaciones relacionadas con la enseñanza en un entorno simulado y seguro. Durante una sesión de simulación, los MPF ven a través de la pantalla de una computadora a los estudiantes o avatar en un salón de clases. El MPF inicia su interacción con estos avatars de la misma manera que lo haría en un salón de clases. De forma tal que lo que parece, a vista del MPF, una interacción con un avatar de computadora, es realmente una interacción semi-controlada, estructurada y preparada con un especialista. El hecho de que sea un especialista el que controla los avatar y no un programa de computación para realidad virtual, da la flexibilidad de poder ofrecer al MPF un infinito número de posibilidades de preparación, en situaciones tan inesperadas, como podría ocurrir en un salón de clases real. Algo importante, es que estos entornos proporcionan al MPF un sentido de la realidad en el que hay un "presente real", definido por Dieker et al. (2015) como la percepción de que algo real está sucediendo.

Métodos

Desde el otoño de 2018 hasta el otoño de 2019, 166 MPF que han tomado el curso de métodos matemáticos para primaria han participado en el estudio, de los cuales 92% han sido mujeres y 8% hombres. Todos los participantes se encontraban en su primer o segundo año del programa de preparación docente. Como parte de los requerimientos del curso, todos MPF debían realizar una entrevista con un estudiante de primaria y evaluar la comprensión de este al resolver una serie problemas de matemáticas. Así, durante el curso MPF fueron expuestos a las teorías de resolución de problemas, y de aprendizaje y enseñanza de métodos matemáticos para primaria, se analizaron videos, se hicieron prácticas y ensayos en clases y se les pidió que tuvieran 3 sesiones de simulación con realidad mixta. Las SRM duraron entre 7 y 12 minutos y fueron video grabadas, y en cada una se usó un problema diferente. Los problemas siguieron el marco teórico de problemas de instrucción cognitiva guiada o mejor conocido en inglés como "*Cognitive Guided Intruction*" de Carpenter, Fennema, Franke, Levi y Empson, (2014). Las sesiones de SRM se distribuyeron durante el semestre para garantizar que los MPF asimilaran los conceptos teóricos y pedagógicos discutidos en clase.

Instrumento

Se usó una encuesta adaptada de Hudson, Voytecki y Zhang, (2018), Bousfield, (2017) y Rasimah, Ahmad y Zaman, (2011). La encuesta comprende 27 preguntas en una escala de 1 a 5 que va desde completamente de acuerdo, a completamente en desacuerdo (ver apéndice A). Además, se incluyeron 4 preguntas abiertas para capturar las opiniones de los MPF sobre lo más positivo o negativo de la experiencia con SRM, los desafíos que tuvieron al ser preparados en su formación a través del SRM y las percepciones de los beneficios de la formación con SRM.

Resultados y Discusión

La implementación de simulaciones de realidad mixta permite a los MPF en formación participar en entornos de aula virtual que simulan aulas reales. En este sentido, el 94% de los maestros en formación están de acuerdo o totalmente de acuerdo en que las sesiones de SRM simulaban una experiencia muy parecida y real a la del aula, y 97% expresaron que ven las prácticas con los SRM como una experiencia muy positiva. Por ejemplo, algunos participantes dijeron:"[Las simulaciones con SRM] proporciona experiencias inesperadas que tuve que solucionar, y me ayudo a sentirme mejor preparado para el mundo real"; "Cómo hablan y actúan los avatar, parecen como niños reales, especialmente con sus respuestas"; “Me gustó poder practicar como si fuera un aula real”; "Pude practicar como si realmente estuviera delante de la salón de clase con estudiantes reales". El uso de SRM en un programa de preparación docente no pretende desplazar la experiencia real, sino más bien mejorar la experiencia de formación de los MPF (Peterson-Ahmad, 2018), en un entorno protegido, semi-controlado y seguro (Hatton, Birchfield y Megowan-Romanowicz, 2008). Los MPF en el estudio reconocen lo anterior, por lo que el 97% están de acuerdo o totalmente de acuerdo en que el uso de SRM es una forma efectiva de practicar nuevas habilidades en el aula, particularmente en matemáticas, de los cuales el 94 y el 97%, respectivamente, expresaron sentirse ahora con más confianza y mejor preparados para enseñar matemáticas de manera efectiva o para involucrar a sus estudiantes en temas que involucren discusiones sobre actividades de resolución de problemas. Por ejemplo, un MPF resaltó lo siguiente: "Lo que me gustó de la SRM es que pude practicar problemas de matemáticas como si realmente lo estuviera enseñando a estudiantes reales". Así, el 88% de los MPF están de acuerdo o totalmente de acuerdo con que después de haber estado expuestos y practicado con SRM, se sienten mejor preparados para llevar a cabo entrevista con un estudiante sobre temas matemáticos donde ellos deban evaluar y verificar las ideas, pensamientos, y comprensiones de sus estudiantes, utilizando MPCM. Otro MPF expreso su opinión en este sentido: “[Usar SRM] fue divertido y atractivo ... las simulaciones me ayudaron a fortalecer mi comprensión sobre los temas que se enseñan en clase, en particular mis habilidades para hablar e interactuar con los estudiantes en clases [es decir, los MPCM] ”.

Por último, los maestros de primaria en formación reconocieron los beneficios de haber estado expuestos a una tecnología de vanguardia que se utiliza como una herramienta educativa para mejorar, acrecentar, y facilitar la adquisición de prácticas educativas como las estrategias pedagógicas de enseñanza de alto apoyo académico, por lo que los MPF mencionan que desearían tener más tiempo para interactuar en con las simulaciones de realidad mixta.

Conclusiones

La forma en que los maestros son preparados es muy relevante, ya que es durante este tiempo cuando adquieren las habilidades y los conocimientos necesarios para su futuro trabajo como docentes (Vagi, Pivovarova y Miedel Barnard, 2019). Así, resulta relevante reportar los hallazgos de este estudio, para que otros programas de preparación de maestros conozcan los beneficios y el potencial de integrar tecnologías emergentes como las simulaciones de realidad mita en sus cursos y mejoren las habilidades de enseñanza de sus maestros de primaria en formación, desde el primer día

del de clases. Como se muestra en la sección anterior, las percepciones y opiniones de los MPF sobre la utilidad de las SRM son muy positivas, lo que facilitaría su integración. De igual manera, al ser vista como positiva la integración de SRM, el tiempo, esfuerzo y recursos destinados a implementar las simulaciones estarían acertadamente justificadas. El uso de SRM en un programa de preparación docente, particularmente en un curso de método matemático, es una forma innovadora de mejorar la adquisición de habilidades de enseñanza de los MPF. El uso bien estructurado, guiado, y planificado de la tecnología (Venkatesh et al., 2003) — como se implementan las SRM en este estudio— ayudó a los MPF a percibir a las SRM como una herramienta destinada a mejorar sus habilidades pedagógicas de enseñanza de alto apoyo académico (Ball & Forzani, 2011), y no para sustituir la experiencia real, que es una limitación común durante los primeros años en el que los maestros reciben su formación.

Los resultados presentados aquí son sólo la primera fase de un estudio más amplio que involucra el análisis de las transcripciones de los maestros de primaria en formación una vez que han realizado la entrevista con estudiantes de primaria. Los resultados de este estudio serán analizados, contrastados y presentados en otro informe en este mismo foro, mientras tanto, se seguirán recopilando más datos sobre las percepciones, puntos de vista y opiniones de los MPF sobre el uso de simulaciones de realidad mixta como parte de la preparación de maestros.

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