Student Perspectives on Using Virtual Reality to Create Informal Connection and Engagement

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Abstract. Following the global pandemic, educators relied heavily on live videoconferencing options and online meeting spaces to host class in lieu of traditional, in-person classroom learning. Yet, exhaustion and Zoom fatigue fueled a lack of engagement in such online spaces, while simultaneously the need for more informal connection to support learners' emotional well-being emerged. This study aims to better understand how online learners perceive the use of virtual reality (VR) as an alternative platform to informally connect and engage with one another, and to ascertain the impact on their satisfaction and motivation for such engagement. Specifically, the investigation sought to examine participant perceptions of social presence felt, the ability to connect and exchange informally, and the impact on motivation, digital literacy, and satisfaction overall.

Following the global pandemic, the world grew to rely more heavily on technology to maintain workflow, synchronous meetings, and connection (Vargo et al., 2021). Videoconferencing platforms (such as Zoom, Skype for Business, Google Hangouts, GoToMeetings, and Cisco WebX) replaced live, in-person meetings, classrooms, and offices. In particular, higher education institutions rapidly transitioned to online and hybrid modalities using learning management systems (LMS) and supportive asynchronous communication tools (such as document sharing repositories, screen sharing/recording tools, virtual workboards and workspaces). Although these tools afforded a way to remain connected while learning and working remotely, individuals also began to suffer from an abundance of screen-time and overscheduled synchronous meetings using these technology-supported meeting spaces–leading to "Zoom-fatigue", distraction, and a lack of interest in online social events (Fosslien & Duffy, 2020; Wiederhold, 2020). During this time, researchers also discovered the need for more intentional and informal opportunities to socially connect with classmates, peers, and colleagues–demonstrating the detrimental effect of isolation, anxiety, and burn out as a consequence of unanticipated remote working and learning (Brooks et al., 2020; Hwang et al., 2020; Toscano & Zappala, 2020; Wang et al., 2020).

While individuals and organizations sought to combine (and simultaneously felt overwhelmed by) the use of synchronous and asynchronous tools to maintain productivity, they also unearthed the need for informal, social connection and engagement to support the emotional aspects lost from the move to these online environments (Toscano & Zappala, 2020). However, utilizing the same work-based platforms (LMS and videoconferencing) proved to be somewhat exhausting, unmotivating, and lacked the authentic feel of the social environments they tried to replicate–from the office water cooler to celebratory events to informal conversations over coffee (Fosslien & Duffy, 2020; Wiederhold, 2020).

With an understanding that learning and working remotely were essential tasks at hand, the importance of supporting the social and emotional needs of our learners and workers became evident. In particular, the need for meaningful social engagement, informal exchange, and (for lack of a better word)–fun! Yet, given the lack of motivation or interest to socially connect, using the same technologies that were leading to exhaustion and fatigue, this investigator sought to explore options to address this need by using virtual reality.

Literature Review

What is Virtual Reality (VR) and Why Use it to Enhance Engagement?

Virtual Reality (VR) is defined as "technology which allows a user to interact with a computer-simulated environment, whether that environment is a simulation or the real world or an imaginary world" (Mandal, 2013, p. 304). While virtual reality emerged as a new paradigm in computer technology, it also grew in popularity in the gaming industry and, initially, required expensive equipment (such as head mounts, gloves, or VR goggles) for use. However, in 2003, the launch of SecondLife® introduced a virtual space where users could create their own avatars and socialize in a virtual space together (Dailey-Hebert et. al, 2020). By 2012, a smartphone display for VR was released and made VR more affordable and accessible to industry and educational domains. In a 2019 Horizon Report, the adoption of artificial intelligence and mixed or virtual reality were listed as important developments for technology use in higher education (Alexander et. al, 2019). Yet, intentional use and design is essential to ensure that VR can support learner engagement. Sherman and Craig (2003) found VR to include features that support immersion, interactivity, and people on the creating and receiving sides of the medium in the virtual world – highlighting the importance of *presence* and *engagement* in VR. In particular, research suggests that VR provides a more realistic experience, which results in a higher sense of *presence* (Slater & Wilbur, 1997), and consequently, a more powerful emotional impact (Milk, 2015), which leads to *higher engagement* and *motivation* (Lee et al., 2010).

VR provides a more realistic experience, which results in a higher sense of presence, and consequently, a more powerful emotional impact.

Digital Literacy and How Virtual Reality (VR) is Being Used in Higher Education

Digital literacy is the ability to use information and communication technologies effectively (Santos & Serpa, 2017). Virtual reality has been utilized in higher education to promote learner engagement across the disciplines and in a variety of settings such as building virtual cities in a local government class, creating products to sell in a virtual world for a brand management class, and through virtual labs in a biology course (Dailey-Hebert et al., 2021). Additional examples of VR use in higher education include training experiences for pre-service teachers (Bower et. al., 2017), VR gaming to support language literacy and language acquisition (Swier & Peterson, 2018), and medical training through virtual reality-based simulations (De Ponti et. al., 2020). Although VR can be intimidating for new users, research has shown that VR can

promote a more authentic space (Berki, 2020), promote empathy (Dean et al., 2020), create opportunities for more realistic exchange (Safadel et al., 2021), and improve satisfaction of the participant experience (Wang et al., 2020). Therefore, this study sought to investigate the impact of using virtual reality (VR) as a social space for informal connection between and among learners enrolled in two fully online graduate classes. Specifically, the researcher/instructor sought to examine participants' perceptions of social presence felt, the ability to connect and exchange informally, and the overall impact of motivation, digital literacy, and satisfaction.

Purpose

The purpose of this study was three-fold. The first goal was to better understand how learners (fully online graduate students) perceive the use of VR as a platform to informally connect and engage with one another. The second goal was to ascertain the impact on their satisfaction and motivation for such engagement using the VR platform. The final goal aimed to identify lessons learned (for participants and facilitators) for using this platform and to determine whether using the VR platform would impact their perception of (and interest in) using VR in the future.

RQ1: How do fully online graduate students perceive using virtual reality as a platform to connect?

RQ2: What impact (if any) does using virtual reality have on participants' overall satisfaction and motivation to engage in this modality?

RQ3: What strategies, practices, and techniques should facilitators and participants consider when using this VR platform (Kumospace)?

Methods

This study sought to examine the perspective of online graduate students using VR to connect and sought to gain perspectives from both novice and experienced students in the program (i.e., those entering their *first course* in a fully online graduate program, and more seasoned graduate students nearing the *end* of their graduate program). Data was collected during the 2021 Fall semester with graduate students enrolled in two fully online courses. The two courses included *ED504: Learning as a Competitive Advantage* and *ED 565: Team Learning and Innovation*, and both courses were led by the study investigator. Each class utilized live, weekly videoconferencing (Zoom) to discuss thoughts and ideas related to learning content for the majority of the course and then utilized a VR platform (Kumospace) to conduct their live session at the end of the course for an informal social event. At the conclusion of the course, participants were sent a survey to share their thoughts, reflections, and reactions to the experience of using the VR platform (Kumospace). The survey results were analyzed with SPSS and coded to identify emergent themes and topics. Standard deviation and median were calculated from the survey (see Results), and emergent themes from open-ended comments were coded using Dedoose (an online platform for analyzing qualitative and mixed-method research). Some emergent themes from the open-ended comments included: future and intentional uses of VR, training needs, and engagement through enjoyment. All participants were informed about the research project and

invited to participate in the study. An informed consent and survey were provided to all invited participants who joined the VR sessions, and data was gathered online via an electronic JotForm survey.

Procedures

The instructor evaluated several VR technologies prior to selecting Kumospace for this study. This selection was made based on the 1) ease of use, 2) cost-free account options, 3) no additional equipment or downloads required for users, and 4) intuitive use of the platform. Additionally, having options to customize the space for the class was also a desired feature. The free VR account accommodated up to 30 users in one room (VR space) and was suitable for use in the class sizes. The instructor (PI) created a free Kumospace account and used the templates provided in the platform to customize a VR room for the learners/study participants. Additional signs and cuing provided prompts that would allow participants to explore the VR space prior to the class discussion. Six zones were created in the VR room that included a piano lounge (with piano music playing in the background), a living room with a television screen that looped an embedded YouTube tutorial for using Kumospace, a Spotify-enabled jukebox for the class playlist, a space with chairs and boardgames that could be played online with a partner, a refreshment station (to get a virtual drink and snack), and a presentation area with active whiteboarding features (see Images 1-3).

The customized VR (Kumospace) room was available via a live hyperlink that was shared with class participants and was accessible by clicking on the hyperlink, entering their name, and joining the room. Students received communication (via course announcements, emails, Slack channel, and discussion board) to join the weekly live session using Kumospace. In addition to the direct link and overview, a brief introduction and 2-minute video tutorial was also sent in advance of the session.

Image 1

Virtual Reality Room Spaces – Whiteboard and Refreshments

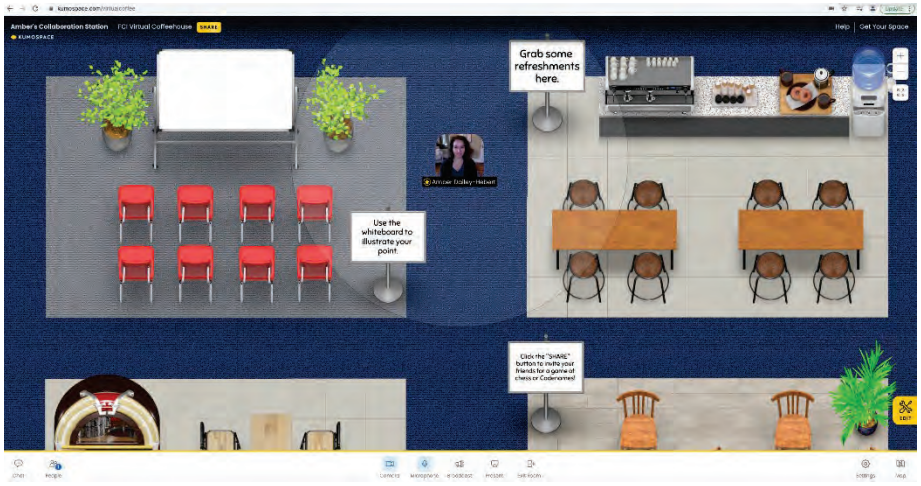


Image 2

Virtual Reality Room – Jukebox and Game Room

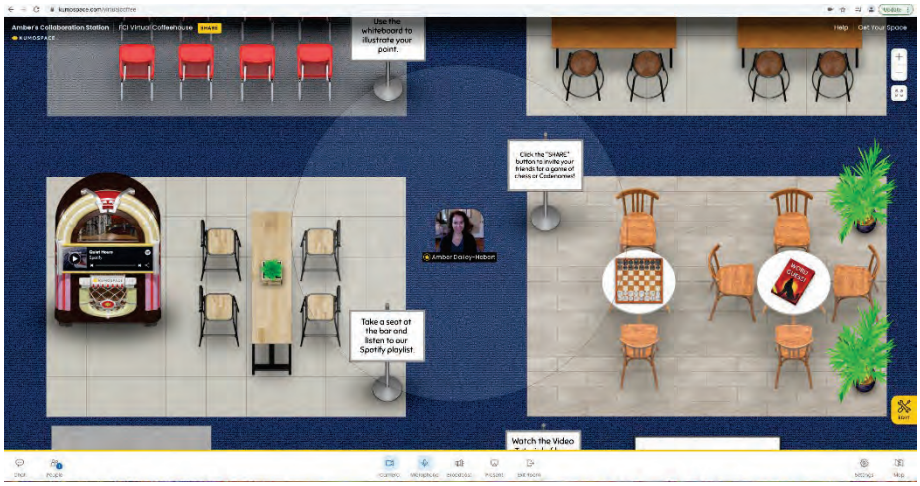
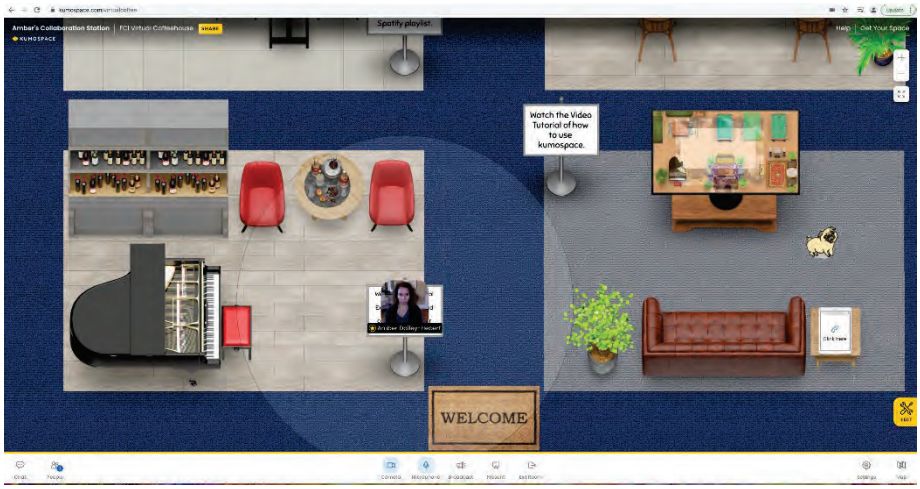


Image 3

Virtual Reality Room – Welcome and Video Tutorial



All participants were asked to use a Google Chrome browser, which was recommended by the VR platform, and were invited to join the call 10 minutes in advance if they had any concerns or technical questions pertaining to the platform setup or access. All participants were able to join successfully without any issues, with the exception of one student who experienced technical difficulty with the microphone function. The participant switched to a different computer and rejoined the session successfully.

Participants

Participants included graduate students enrolled in two required, core courses of a fully online Master's degree program. *ED 504: Learning as a Competitive Advantage* and *ED 565: Team Learning and Innovation* were the two courses used in this study. The principal investigator of this study was also the instructor for both courses, which allowed for data collection and observation of the student experience. One class (ED504) consisted of the first course in the graduate program with a cohort of 10 new students, and the second course (ED 565) included a cohort of 11 advanced students in their second year of the program. Of the twenty-one students invited to participate in the study, seventeen completed the survey (N=17). All participants were adults with an intergenerational mix of approximately 53% (30-44 years old), 24% (45-65 years old), 18% (18-29 years old), and 5% who were 65 years or older. The participants' highest educational degree obtained included a majority (60%) with an earned bachelor's degree, 24% with an earned master's degree, and 18% with a doctorate or terminal degree. Therefore, the sample included a highly educated and diverse group of approximately 60% female and 40% male participants. Additionally, the majority (94%) had experience using videoconferencing tools and used them approximately 1-4 hours a day. Yet, the majority (53%) had never used VR to informally connect with peers, classmates, or co-workers. Participants from both classes were sent an email invitation (with informed consent) and a link to the electronic survey (via JotForm) from the principal investigator/course instructor. All information was kept anonymous via an online JotForm for the survey, and no individual identifiers were used or shared.

Materials

The survey collected demographic information, prior experience with VR technology, and perspectives on the VR experience in the course. Demographic information was collected for age, gender, and education (highest degree obtained). Additional information was collected on each participant's level of experience using videoconferencing tools and level of experience using VR tools. Upon review of the literature, a single survey to assess the aspects and aims of this study did not exist. Therefore, the survey was crafted with instructor-developed questions and questions adapted from existing surveys on the explored concepts in this study. The survey consisted of 19 Likert-scale questions to assess perceived improvement and confidence with *digital literacy*, *presence* (Slater et al.,1994) in the VR space; *physical space* (Lessiter et al., 2002); level of *engagement* (NSSE Student Engagement Survey), and *satisfaction* (Njoroge et al., 2012). The Likert-scale dimensions ranged from 1 = strongly disagree, 2 = disagree, 3= neither agree or disagree, 4 = agree, and 5 = strongly agree. Finally, four additional open-ended questions were included in the survey for participant responses focusing on advice for future facilitators and participants. Although not included in the original survey as indicators, the table (see Appendix) explicitly lists the concept sections and questions adapted from existing research.

The survey was administered following the final Kumospace (VR) live session and was sent via email, course announcement, Slack channel, and discussion board posting to all course participants. The survey was open to complete for approximately two weeks following the invitation to participate in the study/complete the survey.

Data was collected via JotForm (N=17) and reviewed, analyzed based upon the survey responses and open-ended question responses.

Results

Findings from this research strongly affirmed that fully online graduate students (in this small sample) appreciated the opportunity to socially connect with their peers using the VR platform (Kumospace) provided. Results indicated that students perceived an improved digital literacy and confidence in using VR, felt present and engaged in the class community, and were motivated to connect using this platform. Overall satisfaction was high among participants, and they indicated a desire to use the platform in the future. Additional information and detailed results are outlined below.

Digital Literacy

Students perceived an increase in their confidence using VR and improved digital literacy following the class sessions in Kumospace. In fact, 95% agreed or strongly agreed that "using Kumospace improved my digital literacy and understanding of virtual reality", and 95% agreed or strongly agreed that "using Kumospace increased my confidence for using virtual reality in the future". Additionally, a surprising 100% indicated that they "will consider using VR technology in the future" based on the experience.

Table 1

Summary of Digital Literacy Survey Responses

Digital Literacy	***Median***	***Standard Deviation***	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
1. Using Kumospace improved my digital literacy and understanding of virtual reality (VR).	***4.24***	0.56	0	0	1	11	5
2. Using Kumospace increased my confidence for using virtual reality in the future.	***4.35***	0.61	0	0	1	9	7
3. I will consider utilizing virtual reality (VR) technology in the future.	***4.60***	0.51	0	0	0	7	10

Presence

One argument of existing online learning environments is the lack of feeling present with others or feeling disconnected and isolated. Therefore, we assessed student perceptions of whether the VR space improved their sense of presence, defined as "a psychological state in which virtual objects are experienced as actual objects in either sensory or non-sensory ways" (Lee, 2004, p. 27). Approximately 76% of participants agreed/strongly agreed that "In the virtual environment, I had a sense of being there", while over 94% felt "involved and had a sense of being in the scenes displayed with my peers". Participants also appreciated the flexibility of the VR space to navigate between varied conversations with 94% agreeing or strongly agreeing that "Using Kumospace allowed me to navigate and join different conversations in the room".

Table 2

Summary of Presence Survey Responses

Presence *(questions adapted from Slater et al., 1994; Lessiter et al., 2002)*	***Median***	***Standard Deviation***	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
4. In the virtual environment I had a sense of being there.	***4.06***	0.83	0	0	4	8	5
5. I felt involved and had a sense of being in the scenes displayed with my peers.	***4.41***	0.62	0	0	1	8	8
6. Using Kumospace, allowed me to navigate and join different conversations in the room.	***4.53***	0.62	0	0	1	6	10

Engagement

Students perceived improved connection and engagement while using the VR platform (Kumospace) with their class. In particular, 94% reported that "Using Kumospace improved my informal connection with colleagues", while 88% agreed or strongly agreed that "using Kumospace improved my feelings of community".

Table 3

Summary of Engagement Survey Responses

Engagement *(questions adapted from NSSE Student Engagement Survey)*	***Median***	***Standard Deviation***	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
7. Using Kumospace improved my informal connection with colleagues. *(i.e. I learned new things about my colleagues we wouldn't typically share in a work call).*	***4.47***	0.62			1	7	9
8. Using Kumospace for this event, improved my feelings of community.	***4.35***	0.70	0	0	2	7	8

Motivation

Findings revealed high motivation by participants to engage with their peers and explore the VR space. In the survey, 94% "felt motivated to use Kumospace to engage in conversation with my peers" and 94% agreed or strongly agreed that they were "motivated to explore the Kumospace VR room and features available". Most notably, a significant 100% of participants reported that the VR platform "was more fun to use than other videoconferencing systems" that they typically utilize for school or work. Therefore, the use of such platforms may hold potential for improved motivation to engage and enjoy the opportunity to connect.

Table 4

Summary of Motivation Survey Responses

Motivation	***Median***	***Standard Deviation***	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
9. I felt motivated to use Kumospace to engage in conversations with my peers.	***4.59***	0.62	0	0	1	5	11

Table 4 Cont.

Motivation	*Median*	*Standard Deviation*	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
10. I was motivated to explore the Kumospace VR room and features available.	***4.53***	0.62	0	0	1	6	10
11. Kumospace was more fun to use than our videoconferencing system.	***4.65***	0.49	0	0	0	6	11

Social Connection

Although participants overwhelmingly reported that they "enjoyed using Kumospace as the social environment" with 100% who agreed or strongly agreed, only 76% thought that "using Kumospace improved the quality of interactions between me and my colleagues". However, it was clear to see that all participants placed importance on the need and desire to connect with their peers in such ways, as 100% reported, "I think it's important to socially connect with my peers/colleagues and that it improves our working relationship".

Table 5

Summary of Social Connection Survey Responses

Social Connection	*Median*	*Standard Deviation*	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
12. Using Kumospace improved the quality of interaction between me and my colleagues.	***4.18***	0.81	0	0	4	6	7
13. I enjoyed using Kumospace as the social environment.	***4.60***	0.51	0	0	0	7	10
14. I think it is important to socially connect with my peers/colleagues and that it improves our working relationship.	***4.77***	0.44	0	0	0	4	13

Satisfaction

The survey results overwhelmingly identified high levels of satisfaction, as 100% agreed or strongly agreed that "Overall, I am satisfied with the usability of this technology" and "Overall, I'm satisfied with the participant experience in Kumospace". Interestingly, participants also demonstrated a desire to utilize the

platform again with 100% indicating "I would like to use Kumospace in future sessions for social exchange". Finally, 82% indicated a preference to use Kumospace over Zoom for connecting informally with their peers.

Table 6

Summary of Satisfaction Survey Responses

Satisfaction *(questions adapted from Njoroge, Norman, Reed & Suh, 2012)*	***Median***	***Standard Deviation***	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
15. Overall, I am satisfied with the usability (ease of use) for this technology.	***4.71***	0.47	0	0	0	5	12
16. Overall, I am satisfied with the participant experience in Kumospace.	***4.71***	0.47	0	0	0	5	12
17. I would like to use Kumospace in future sessions for social exchange.	***4.71***	0.47	0	0	0	5	12

Advice

In the open-ended questions, student participants shared advice for future facilitators and participants who may use Kumospace. The emergent themes pertained to 1) a need for training to learn the platform, 2) intentional use of the VR space with topical discussions or breakouts, and 3) the desire to make using the VR space fun for participants. Pertaining to the need for training, participant comments included:

> *"Provide a little tutorial at the start to help acclimate to the interface."*
>
> *"Explain the basic ideas of communication within the space (sound circle), activities and movement (arrow keys to move, etc.)".*
>
> *"Use the map to orient yourself to others within the room."*
>
> *"Make sure you know how the circles (for sound) work for being able to interact with others."*

Several ideas were also shared that pertained to the intentional use of the space and included the following recommendations:

> *"Consider using Kumospace for week one, as it is a good way to conduct a meet and greet with new students."*
>
> *"Possibly design the areas of the space to promote topical discussions."*
>
> *"It would be fun to break up in groups in the different rooms and then meet back in the main room for final notes….to decentralize the group into different rooms - then once the class is more familiar with each other, the informal use could be integrated more fully."*

Finally, comments were shared to ensure that the VR room remains a fun and engaging space to connect:

> *"Make sure that you are creative and it doesn't become "gimmick-y" and more of a hassle rather than something cool, fun, and new."*
>
> *"Just continue to keep things light and encourage exploration in the space and congeniality among colleagues. Encourage learners to become familiar with the platform and make it fun!*
>
> *"Explore…it's fun and interactive. Have fun, turn off mute, enjoy the exciting platform, explore the room and designs. Have fun, wander around and just try it out."*

Overall, the VR space was well-received by the online graduate students and was perceived to benefit their digital literacy, confidence, presence, motivation, and satisfaction.

Discussion

The first goal of this study was to better understand how learners (fully online graduate students) perceive the use of VR as a platform to informally connect and engage with one another. Additionally, the investigator sought to determine VR impact on learners' perceptions of their digital literacy and motivation to explore such tools in the future. Results found that students perceived an increase in their confidence using VR and improved digital literacy. With an abundance of free access to information and emergent technology in the knowledge economy today, the importance of building our learners' capacity for digital literacy is essential (Santos & Serpa, 2017). In fact, 95% felt it improved their digital literacy, improved their understanding of virtual reality, and increased their confidence for using virtual reality in the future. Additionally, 100% will consider using VR technology in the future based on the experience. Therefore, the use of VR in this study led to student perception of increased digital literacy, improved confidence in their abilities with technology, and a desire to utilize such technologies in the future.

While many definitions for social engagement exist, this study sought to focus on the community- and relationship-building aspects for such engagement through informal exchange. Research suggests that social engagement should be understood and explored as an outcome of higher education (Van den Wijngaard et al., 2015), and that such engaged classroom communities can reduce anxiety and create a greater sense of belonging (Grossman et al., 2012). Likewise, findings from this study indicate a perceived improvement in the learners' connection and engagement while using the VR platform. In particular, 94% reported improved informal connection their colleagues while 88% experienced an improved feeling of community. Eriksen (2012) and Cunliffe (2016) unearth the importance of such relationships as a way to help students become more 'authentic' and 'self-aware'. Furthermore, participants identified a strong sense of presence during the VR experience, as 94% felt involved and had a sense of being in the scenes displayed with their peers. Results align with research by Berki (2020) which found that presence positively related to learning outcome. Therefore, such findings have potential to inform future teaching practice and uses for such VR to support social engagement, indicating that VR may serve as a good platform to foster motivation, informal connection, and engagement.

Although participants overwhelmingly (100%) reported that they enjoyed using Kumospace as the social environment, only 76% thought it actually improved the *quality* of interactions with their classmates. This finding could have resulted from strong existing connections with their cohort members prior to VR use or could reflect a lower impact on the quality of interactions in the VR platform. Evidence from the research (Makransky et al., 2019) suggests that while VR does lead to greater presence, it does not necessarily lead to greater learning or improved learning outcomes. However, in a sample of over 100 university students, Makransky and Lilleholt (2018) found that immersive VR use predicted presence and positive emotions. Likewise, in this study it was clear to see the importance that all participants (100%) placed on the need and desire to connect with their peers and the belief that socially connecting improves their working relationship. Therefore, it is recommended to use VR for informal connection, celebratory events, or during sessions that aim to foster relationship-building rather than a means to directly improve learning outcomes.

The second goal of this study was to ascertain the impact on their satisfaction and motivation for such engagement using the VR platform. Previous research (Herrero et al., 2014) of VR use and its impact on emotion and motivation have found significant increases in positive emotions, motivation, and self-efficacy. Likewise, the findings from this study revealed high motivation by participants to engage with their peers and explore the VR space. In the survey, 94% of participants felt motivated to use VR to engage in conversation with their peers and were motivated to explore the VR features available. Most notably, 100% of participants reported that the VR platform "was more fun to use than other videoconferencing systems" typically utilized for school or work. Therefore, the use of such platforms may hold potential for improved motivation to engage and enjoy the opportunity to connect. Likewise, as research (Chen et al., 2016) indicates, VR use can increase user satisfaction and ensure usability. Findings overwhelmingly identified high levels of satisfaction, as 100% of participants were satisfied with the usability of this technology and with the overall experience in the VR space. Interestingly, participants also demonstrated a desire to utilize the

platform again with 100% indicating "I would like to use Kumospace in the future sessions for social exchange". Finally, 82% (14 out of 17) indicated a preference to use Kumospace over Zoom for connecting informally with their peers.

The final goal aimed to identify lessons learned (for participants and facilitators) for using this platform and to determine whether using the VR platform would impact their perception of (and interest in) using VR in the future. As previously mentioned, all participants indicated improved confidence in using VR and shared an interest in using VR in the future. Additionally, recommendations included intentional design and use of the platform, advanced training for users, and creating a focus on fun, informality, and connection.

Conclusion

Although more significant research is needed with larger sample sizes, various disciplines and program levels, and a dedicated instrument created to assess pre and post VR use, this study serves to unearth how it can be applied to improve the learner experience, to foster engagement, connection, and digital literacy. The use of VR in this study led to student perception of increased digital literacy, improved confidence in their abilities with technology, and a desire to utilize such technologies in the future. Such findings have potential to inform future teaching practice and uses for such VR to support social engagement, indicating that VR may serve as a good platform to foster motivation, informal connection, and engagement.

Instructors should be mindful of the goals and intention for such VR use in their classes, as the study also revealed that VR may lead to greater presence, but that it does not necessarily lead to greater learning or improved learning outcomes. Therefore, it is recommended to use VR for informal connection, celebratory events, or during sessions that aim to foster relationship-building. This might include the first live class session, a student-faculty meet and greet prior to the beginning of the semester, a class presentation or end of term celebration. Instructors may also consider utilizing the VR space as an optional "virtual coffeehouse" for students to informally connect or as an alternative space to conduct office hours and student consultations online. Participants from this study offered creative ways to design intentional and meaningful experiences using the platform (such as designating areas of the VR space for topic-based discussion or decentralizing the VR space into different rooms to explorations or adventures). Hence, there is also opportunity for instructors to *partner* with student participants to co-create appropriate uses for VR in their class to foster connection, engagement, motivation, and meaning.

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Appendix

Survey of Student Perceptions on Using Virtual Reality (Kumospace)

	1 strongly disagree	2 disagree	3 neither agree nor disagree	4 agree	5 strongly agree
Digital Literacy					
1. Using Kumospace improved my digital literacy and understanding of virtual reality (VR).					
2. Using Kumospace increased my confidence for using virtual reality in the future.					
3. I will consider utilizing virtual reality (VR) technology in the future.					
Presence (questions adapted from Slater et al., 1994; physical space/ engagement from Lessiter et al., 2002)					
4. In the virtual environment I had a sense of being there.					
5. I felt involved and had a sense of being in the scenes displayed with my peers.					
6. Using Kumospace, allowed me to navigate and join different conversations in the room.					
Engagement (questions adapted from NSSE Student Engagement Survey)					
7. Using Kumospace improved my informal connection with colleagues. *(i.e. I learned new things about my colleagues we wouldn't typically share in a work call).*					
8. Using Kumospace for this event, improved my feelings of community.					
Motivation					
9. I felt motivated to use Kumospace to engage in conversations with my peers.					
10. I was motivated to explore the Kumospace VR room and features available.					
11. Kumospace was more fun to use than our videoconferencing system.					

Social Connection (instructor created)					
12. Using Kumospace improved the quality of interaction between me and my colleagues.					
13. I enjoyed using Kumospace as the social environment.					
14. I think it is important to socially connect with my peers/colleagues and that it improves our working relationship.					
Satisfaction (questions adapted from Njoroge, Norman, Reed & Suh, 2012)					
15. Overall, I am satisfied with the usability (ease of use) for this technology.					
16. Overall, I am satisfied with the participant experience in Kumospace.					
17. I would like to use Kumospace in future sessions for social exchange.					
18. In comparison, I prefer to use _____ for live sessions to socially connect with peers.	1 zoom		2 Kumospace		
Open Ended Questions					
What advice would you give a facilitator using Kumospace? What advice would you give participants using Kumospace? The use of Kumospace would be more effective if….. Please share any additional comments:					

Amber Dailey-Hebert, PhD, *is a scholar on the future of learning & working. Having lived and worked abroad in the United States, Europe, and Africa, she has been fortunate to be part of collaborative efforts around the globe (academic, research, government & consulting) that leverage emergent technologies and innovative teaching methods to revolutionize the landscape of lifelong learning. Her administrative academic experience includes Department Chair, Program Coordinator, Associate Dean, and she currently serves as a full professor and Director at the* Faculty Center for Innovation *at Park University.*