A Study of the Student Experience in Video Conferences and Virtual Worlds as a Basis for Designing the Online Learning Experience

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Abstract—The design of online learning environments has a fundamental and immediate impact on how students experience learning in these environments and particularly on the students' satisfaction and learning engagement. The COVID-19 pandemic has resulted in students participating in online learning on a large scale and forcing educational institutions to adopt various communication and virtual teaching environments: this has provided an opportunity to study and compare different online learning environments. To understand the design performance of the currently available virtual learning environments, they should be considered and evaluated from the students' point of view. Identifying their pros and cons gives designers a better idea of how to enhance the design of virtual learning environments and provide a positive educational experience for students. The two most broadly used types of virtual learning environments are video conferencing and virtual worlds. These two mediums provide different affordances for students to experience and interact with the learning materials as well as to interact with the instructor and other students. This paper reports on a study comparing the use of Zoom as an example of video conferencing and Gather.Town as an example of a virtual world in online learning during the COVID-19 pandemic. The study is based on students' responses to an online survey asking them to compare the two environments based on their experience in their courses. The participants were CS undergraduate students exposed to both environments and experiences with both platforms. A qualitative analysis of the data collected showed that students realized certain values from the affordances offered by the virtual world environment that facilitated collaborative learning with peers and instructors and made the learning experience more effective and engaging.

Index Terms—online learning, learning environments, design, virtual world, video conferencing

I. Introduction

The design of online learning environments has a fundamental and immediate impact on how students experience learning in these environments. To get a better idea of the design performance of the currently available virtual learning environments (VLEs) with all the primary and complementary necessities of virtual classes, the affordances provided by these environments should be evaluated from their users' point of view. Furthermore, identifying their pros and cons gives designers ideas on how enhance their design and provide a better educational experience for students. In the early time of the pandemic COVID-19, more than 160 countries enacted the national shutdown, affecting 87 percent of the world's student population [1]. The need for social-distancing measures placed enormous pressure on students to abruptly switch to online learning and adapt to new forms of digital learning [2]. In this period, educational institutions also were forced to operate entirely online and employ different communication platforms to accommodate the online classrooms. Indeed, due to different types of affordances, learning experiences via these mediums differed from traditional face-to-face classrooms and even each other. The traditional face-to-face classrooms provide various types of in-class interactions and affordances, leading to experiences that many of the students in higher education are familiar with and adapted to over the years. However, online classrooms in different virtual environments, with constantly emerging and updating types of interactions and affordances, which sometimes are entirely new for the students, afford them different experiences.

A meta-analysis of digital learning platforms indicate that dependence on online learning environments is not always successful [3]. Students feel online learning has not provided a better experience or productivity in mastering competencies [4]. Reports during the pandemic have highlighted issues such as learning loss, productivity loss, and emotional distress among students all around the globe [2]. It may be worthwhile to examine whether the design of online learning mediums has contributed to these negative experiences, and how their designs have influenced the students' cognitive and emotional experience.

This study evaluates the student experience and perception of Gather.Town and Zoom as two exemplars of the prevalent forms of online learning environments, virtual worlds and video conferencing, in order to determine the strengths and weaknesses of their design in terms of students' perceptions and experiences. In the learning process, students' perceptions can be used as evaluations to improve the quality of learning [4]. In order to find the advantages and disadvantages of virtual worlds and video conferencing design affordances, this study addresses the following questions:

- How are the affordances of Gather.Town different from

Zoom for an online learning experience?

- How do students feel about online learning in a virtual world?
- What do students value in online learning platforms?

II. BACKGROUND

Student online learning is not the same experience as traditional face-to-face learning [5]. Various studies outline mixed positive and negative experiences on online education [6]. These experiences comprise students' emotional and cognitive encounters in online classes. For centuries, philosophers and psychologists considered emotions as inferior to cognition [7]. However, further investigations have revealed that emotions are ubiquitous in academic settings, and they profoundly affect students' academic engagement and performance [8], [9]. Two of the principal aspects of academic engagement are behavioral and emotional engagement. Behavioral engagement is characterized as students' attention and focus on the subject, and participation in the class. Students' passion, curiosity, delight, liveliness, and zest for the class are referred to as emotional involvement [10]. Research indicates students' engagement enhances their satisfaction, motivation to learn, performance in online courses, and reduces their sense of isolation [11], and likewise has continuously been demonstrated to be a key predictor of their achievement, class attendance, retention, and academic resilience.

The intellectually stimulating interchange of ideas and in-class interactions are other vital aspects of a successful class in terms of students' positive experiences [11]. Yoon believes that for meaningful learning experiences, learning should emerge from students' interactions with meaningful content, the course instructor, and peers [12]. In their investigation, Kyei-Blankson et al. [13] also argue that teaching presence and learner-instructor interactions have been the most influential factors in their studied students' experience.

In delivering these essential elements, online classes have their own pros and cons. Some of the advantages include providing opportunities for students worldwide [14], convenience and flexibility, and the instant availability of necessary support if needed [15]. Standl et al. [16] argue that some features of online classes are even better than face-to-face ones, such as group building process and group organization. On the other hand, the analysis results reveal that the most significant factors behind the students' dissatisfaction during online learning are distraction and reduced focus, psychological issues, and management issues [5]. In virtual classes, it is easier for the student to avoid direct participation and engagement. Also, the absence of face-to-face contact in virtual negotiations leads students to miss the subtleties and important visual cues of the non-verbal language [17].

In addressing these deficiencies, and meeting essential aspects of the online classes, different online mediums provide various affordances which in a broader view aim to enrich students' overall positive experiences and reduce the negative ones in online learning process. Two widely used mediums are virtual worlds and video-conference systems. The designs of each of these environments deliver students and instructors with various affordances in accomplishing the class activities and sometimes draw them back from.

Gather.Town is a web-based platform that provides a game-like 2D world in which video conferencing is spatialized. By joining the world, users are given a customizable avatar. Users can interact with the world by moving the avatar around the space. By getting close to other avatars, their audio and video streams come into focus. This spatialized characteristic replicates people mingling in real life by allowing users to see friends or peers approaching, having a conversation, and then walk away. Furthermore, users can have text chats with other participants, share their screen, and other class-like behaviors such as raising their hands or giving applause to the lecturers [18]. Including diverse materials in diverse formats in the learning space, and the possibility for students and teachers to use private rooms to talk with each other, but easily be found on the map by others, enable a lot of methodical and didactic variations [19]. Proximity-based platforms such as Gather.Town can offer a unique opportunity for learners to interact, at their own pace, with educators, peers, and pre-developed materials to tailor the teaching experience and develop these relationships in a distance-learning context [20].

The other platform that extensively is used in online classes, specifically during the Coronavirus pandemic, is Zoom. Zoom Video Communication Inc. is an online video conferencing platform that provides synchronous communication using audio and visual data. Zoom can replicate classroom environments online. Functions, such as recording sessions, sharing screens and files, breakout rooms, and polling, are all appealing features for educators attempting to replicate traditional classroom settings [21]. These multiple user-friendly features and the expansive range of its use in many educational institutions enrich Zoom's appeal to qualitative and mixed-methods researchers [22]. However, Zoom has several limitations. In their studies, Ramadani et al. [23] argue that instructors have difficulties in assessing and evaluating learners appropriately over Zoom, and for underlying socio-technical reasons, such as being shy, or slow internet, some students cannot express their knowledge over Zoom, which discourages them in working with it. Yarmand et al. [24] likewise report students in in-person vs. online lectures over Zoom experience a loss of sense of community. Some students feel self-conscious about their appearances being broadcast to the entire class, and instead of vibrant participation in the class by audio and video, the majority of students choose to communicate using text chat [24]. In contrast, in previous work focusing on students' perceptions of online learning in 2-D virtual worlds we reported that students found that they connected better with students and the virtual world significantly increased access to instructors and peers for questions and collaboration. They also noted the virtual world had a sense of fun which contributed to students' satisfaction with the environment [25].

In the exploration of the social anxiety inducing aspect of Zoom, Luke [26] identifies several stressors in the use of Zoom including lack of community presence, misread-

ing social/physical causes, lack of clear zoom etiquette and norms, on-screen distractions such as self-focused attention, and increased cognitive load. Furthermore many students have negative experiences in breakout rooms (BR), such as the suddenness of entering and leaving the BRs, lack of consistency, and familiarity [26]. Another manifestation of social anxiety in online classes using Zoom, which diminishes its positive learning environment, is the turned-off cameras. Castelli et al. [27] state several reasons why students don't turn their cameras on, such as being concerned about personal appearance, being concerned about other people, the physical location being seen in the background, and having a weak internet connection. Additionally, some students revealed that social norms also play a role in camera use [27]. From the instructors' perspective, having more students with cameras on is an emotional boost and they prefer to teach to a grid of student faces, as opposed to trying to teach to a grid of black squares [6].

Another negative experience of Zoom is so-called "Zoom fatigue." Zoom fatigue is the exhaustion users feel when communicating through video conferencing platforms [28]. While attending a synchronous large Zoom class, it is easy to recline, drift away, and be unresponsive, exacerbating Zoom fatigue symptoms and decreasing students' capacity to learn, focus, and feel connected with others [29]. Although there are fewer studies of Gather.Town, a virtual world has the potential to be more game like and avoid the experience of Zoom fatigue.

III. A Comparison of Affordances for Student Interaction in Online Learning

The notion of affordance provides a new theoretical foundation for creating and assessing online learning systems [30]. Norman defines affordance as a relationship between an object's properties and the agent's capacities that determine just how the object could be utilized [31]. Gaver distinguishes three categories of affordances: perceptible, hidden, and false affordances. Perceptible affordances are those that have perceptual information associated with them. Affordances that are hidden are ones for which no information is available. False affordances, on the other hand, are those that can lead to a false action [32].

Antonenko presents an educational technology affordance-ability taxonomy for assisting designers and users of educational technologies with the critical task of aligning what the users should do to meet a need with how the technology affords and supports such abilities. This taxonomy provides a shared vocabulary for analyzing the affordances of educational technologies. This framework proposes 10 affordance categories including: Media affordance (the type of input and output forms), Spatial affordance (resize-ability, move-ability, zoom-ability), Temporal affordance (accessibility, record-ability, play-ability, synchronicity), Navigation affordance (browse-ability, link-ability, search-ability, sort-ability), Emphasis affordance (highlight-ability, focus-ability), Synthesis affordance (combine-ability, integrate-ability), Metacognitive affordance (plan-ability, monitor-ability, reflect-ability), Personalization affordance (personalize-ability, customizability), Adaptation affordance (adaptability), Socialization affordance (collaborate-ability, share-ability) [33].

Videoconferencing virtual environments support knowledge delivery and in-class communication in remote education with a focus on visual, audial, and other interactive affordances in attempting to transcend social distance while maintaining the synchronicity of classroom interactions [34]. In Zoom, the Chat affordance adds effective co-constructive parallel communication without interrupting presentation. The whiteboard affordance promotes student collaboration through discussion and note-taking [35]. Students are allowed to show attention and progress in numerous ways including using emojis reactions and chat functions [36]. While utilizing Zoom, students can open multiple tabs or use another browser; Thereby, the in-class discussion has become more practical because ideas may now be communicated immediately and smoothly. There is an affordance for dark/night mode for coping with long screen time exposure, which also can be used to cue students in differentiating between the day class and night class. Virtual wallpaper helps to block all the visual background noises in the students' places which they don't intend to exhibit to their peer classmates [37].

Virtual worlds and other virtual environments with spatial metaphors reclaim some of the benefits of physical co-location, such as the sense of presence [38]. Virtual places that engage learners with emotional experiences can be discovered using Emotional Affordances (EA). As a result, the effectiveness of affordances can be extended beyond functional to emotional dimensions. Furthermore, depending on the students' internal and environmental characteristics, the emotional effects of EA might be positive/negative and intended/unintended [30]. More powerful emotions develop when the activity is viewed as unfamiliar and complicated, as well as its relevance to the learner, and they might vary from highly positive to highly negative, for instance from high levels of excitement to high levels of anxiety towards the new challenge [39].

IV. Survey of Student Experience and Perceptions of Gather.Town vs Zoom

A. Methodology

The goal of this research is to understand the student perspective based on their experiences in online learning in different platforms. We employed a survey questionnaire as a way to guide reflection and to understand students' experience and perception about using Zoom video conferencing and Gather.Town environments.
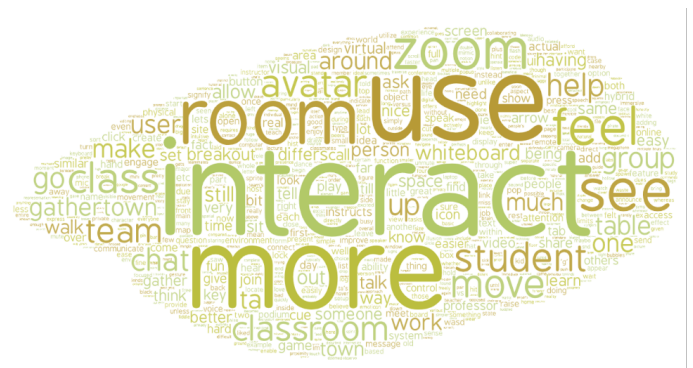
The survey questionnaire included 9 open-ended questions about comparing their experience with Zoom video conferencing and Gather.Town virtual world in their courses. Participants were students from a public US university and included 34 Computer Science and Software and Information Technology students who had experiences with both environments used as an online classroom. The study was approved by our Institutional Research Board (IRB). The survey was

administered using a Google form and data was collected anonymously to allow students the freedom to express their views without fearing an impact on their course grade. Students were enrolled in an Interaction Design Studio in an undergraduate Computer Science program: this was a team based capstone design project course taught in Gather.Town.

The questions in the survey were :

1) What aspects of the Gather.Town classroom experience made your learning experience better or different from a Zoom classroom experience?
2) What are the differences in interaction with your team around tables in Gather.Town compared to breakout rooms in Zoom?
3) What are the differences in interaction with the instructional team in Gather.Town compared to Zoom?
4) What visual cues or interaction techniques helped you move the avatar in Gather.Town?
5) What do you like about using Gather.Town for classroom learning?
6) What interaction cues make it easy to interact with others in Gather.Town?
7) How could you improve the interaction with objects like the shared whiteboard in Gather.Town?
8) How can Gather.Town be used to enable a hybrid classroom?
9) How can the interaction design in Gather.Town be improved?

Questions were open ended and participants provided answers in lengths that varied from a phrase to a paragraph. The average response length to a question was 27 words.

B. Analysis and Data Interpretation

1) Word Frequency Analysis: To understand the text responses collected from the surveys we utilize Natural Language Processing (NLP) methods. NLP is able to extract concepts and relationships from texts. The two main methods we used are word frequency and clustering. The first step in both approaches is to represent text as a vector of features. A common feature extraction technique for textual data is the Bag-of-Words (BoW) model which represents text based on the occurrence of words. It includes a vocabulary of known words and a measure of the presence of those words in the text to be represented. This provides information about the words that appear (and do not appear) in a text. To do this we used an NLP Python library to remove stop words and perform stemming and generate a list of each word that appeared in the text. We also generated a frequency list that records the number of times each word occurs in the text. This process was conducted on the text corpus of all the responses as well as the responses to the individual questions.

This analysis showed the top 10 words are "interact", "use", "more", "room", "student", "classroom", "feel", "avatar", "move", and "whiteboard". Figure 1 shows a word cloud generated from the combined responses to the survey questions. The words highlight the main concepts students used in their

answers. The top occurring word is "interact" which appeared 102 times.

Fig. 1. Word cloud of student text responses to the survey questions

The second NLP method we utilized was clustering. Clustering can be useful for topic extraction as it groups similar items together. To measure the presence of a word we can use a simple count of its occurrence (word frequency) or TF-IDF. In TF-IDF which can be considered an enhanced text representation the word frequencies are normalized in terms of their relative frequency of occurrence in a single document and over the entire corpus. In the TF-IDF representation, the term frequency for each word is normalized by the inverse document frequency, or IDF. The inverse document frequency normalization reduces the weight of terms which occur more frequently in the corpus. This reduces the importance of common terms that appear in the corpus of text, ensuring that the representation is influenced by the more discriminative words which have relatively low frequencies in the corpus. To enhance the performance of clustering we used the TF-IDF representation. We used Python's sklearn library to perform KMeans clustering.

Figure 2 shows a treemap visualizing the result of clustering with the number of clusters set to 9. Each cluster shows the top 10 words and the size of each cluster and its partitions correspond to the TF-IDF values. While we expect concepts related to the questions to appear in the responses, this highlights some relationships. We can see in cluster 7 group and team work concepts related to shared whiteboard and screen. Custer 0 highlights concepts that relate easy and learning to immersive and interaction. Cluster 2 highlights concepts related to game-like interaction such as WASD. Cluster 6 relates avatar and fun concepts with gesture and dance.

Fig. 2. Clusters treemap of text responses to the survey questions

Question	Top 10 Occurring Words
1	more, interact, room, move, classroom, group, feel, avatar, much, around
2	room, breakout, interact, more, table, feel, much, different, see, share
3	team, instructional, interact, more, room, professor, podium, use, student, see
4	move, game, use, interact, arrow, avatar, help, key, around, play, wasd
5	more, classroom, feel, avatar, interact, room, engaged, group, learning, fun.
6	interact, know, chat, people, up, easy, someone, user, avatar, icon

To further explore the data we analyzed the responses to each question individually. We followed a similar approach outlined for the combined responses analysis but adjusting the stop words removed to include the words "zoom", "gather", "town", and "gathertown" and setting the number of clusters to 5. Table I lists the top 10 occurring words for questions 1 thru 6 identified from the student responses. Question 1 asked students to identify the aspects of the GatherTown classroom that made their learning experience better or different from a Zoom-like classroom experience. The top occurring words for this question as shown in Table I indicate the classroom feel, moving around, and interacting with groups featured in many student responses. Figure 3 is the treemap for the clustering visualization highlighting similar relationships in clusters 0 and 3.
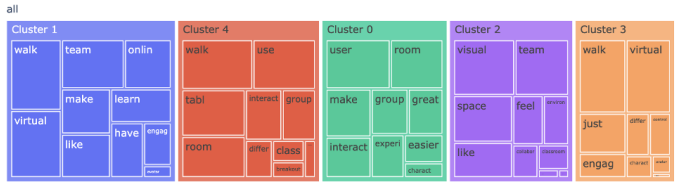

Fig. 3. Clusters treemap of text responses to survey question 1

Question 2 asked about the differences in interaction with teams in their designated area in Gather.Town compared to breakout rooms in Zoom. The words listed in Table I highlight that students were able to identify differences in team interaction and relating that to how they felt and their ability to interact and share. The clustering visualization in Figure 4 highlights the interaction using the whiteboard in clusters 0 and 2 while clusters 3 and 4 highlight the interactions between teams and professors and teaching assistants (TAs).
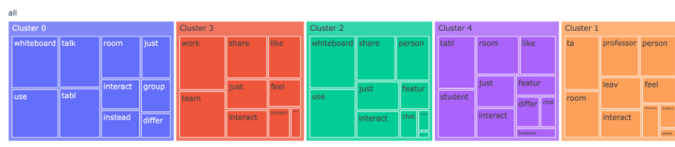

Fig. 4. Clusters treemap of text responses to survey question 2

Question 3 asked students about the differences in interaction with the instructional team between the two environments. Student responses highlight the visual aspects that are similar to a physical classroom. Words like "room", "podium" and "see" are mentioned in the students responses as shown in Table I. Examining the clustering approach results depicted in Figure 5 also emphasizes the visual aspect of Gather.Town (Cluster 3) and that it makes it easier to ask and get help from the instructional team (Clusters 0, 2 and 4).
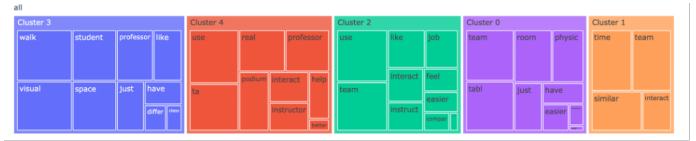

Fig. 5. Clusters treemap of text responses to survey question 3

Question 4 aimed at understanding the visual cues or interaction techniques that helped students move their avatar in Gather.Town. Student responses shown in Table I highlight the game-like characteristics of the interaction in the virtual world. The clustering analysis shown in Figure 6 also highlighted the video game-like interaction made it easier and intuitive to move the avatar using the keyboard. This is further emphasized with the mention of the "WASD" keyboard interaction that is used in many video games (Clusters 0 and 1).
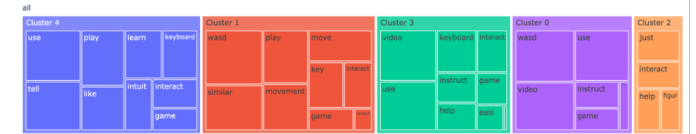

Fig. 6. Clusters treemap of text responses to survey question 4

Question 5 aimed at understanding what students liked about Gather.Town specifically for classroom learning. Table I shows that students thought the classroom-feel and avatars in Gather.Town made it more engaging and fun. These observations are further supported by the clustering analysis shown in Figure 7.

Fig. 7. Clusters treemap of text responses to survey question 5

Question 6 asked about the interaction cues that made it easy to interact with others in Gather.Town. The top words shown

in Table I indicate that students thought the avatars, icons and chat made it easier to interact with others. The clustering analysis shown in Figure 8 highlights additional concepts such as nearby, walking, speaking/talking and hand raising.
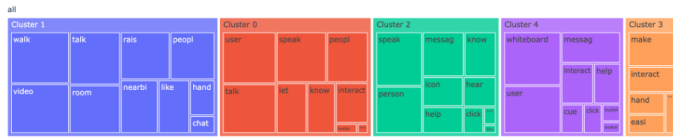

Fig. 8. Clusters treemap of text responses to survey question 6

Questions 7, 8 and 9 asked students to suggest ways to improve the interaction in Gather.Town and how it can be used to enable a hybrid classroom. The NLP analysis was not suitable since these questions are asking students to propose new ideas which make the responses more distinctive and individual rather than having common themes or relationships.

2) Qualitative Summary of Student Responses: The first three questions in the survey asked participants to compare between the two environments. The aim of the comparison was to understand how students perceived their learning experiences and interactions in one environment compared to the other. The other questions were mainly about Gather.Town and its visual cues, interaction techniques, students' favorite features of Gather.Town, and their recommendations for its improvement. Our qualitative analysis is presented according to the research questions in section I:

- How are the affordances of Gather.Town different from Zoom for an online learning experience?
- How do students feel about online learning in a virtual world?
- What do students value in online learning platforms?

In each environment, students recognized various affordances that they found intriguing or dispiriting. They felt a variety of emotions as a result of their exposure to multiple affordances and the sensations that each setting induced in them; some of these encounters aligned with their personal values, while others did not. The affordances that students reported about Gather.Town are predominantly related to its spatial characteristics, affordances such as the ability to move around, proximity-based chat, and private areas with signifiers such as group tables or classroom boundaries. For example, students said:

"I enjoy how it is slightly more exciting and fun to use, as opposed to staring at a black and gray screen in silence. I can see others walking around or talking with speech bubbles above their heads."

"There are options to locate people and to follow them. There is also private chat, nearby chat, and open chat. It is very easy to talk to people."

"I like its private rooms for study sessions."

"Having an avatar and being able to move to and away from my team's table and the main gathering space allows me to participate in the conversations that I want to participate in. The freedom to move around is nice."

Because of these spatial affordances, students reported having more productive and effective interactions with classmates, teammates, and instructing teams.

"It is more interactive. It allows you to take up space and be present in the classroom. You are able to feel like you are actually collaborating together."

"Gathertown changes the learning experience due to its interactive 2D environment."

Furthermore, being in the space provided them a sense of presence, which enhanced their engagement in class. This sense was further strengthened by giving students customizable avatars of the characters. Students indicated that this feature allowed them to assert themselves in the classroom, i.e., self-expression, which had a beneficial influence on their overall experience as well as their improved engagement with the online class. For example, students noted:

"It helps make it feel like I am actually inside of a classroom/meeting space."

"It is more engaging because avatars give more sense of the presence of the teammates."

"walking to your team room and interacting around tables provides a more classroom-like experience."

This is in contrast to their experience in the Zoom environment, where the primary means of communication is through voice and video, and when the cameras are turned off, several students reported feeling as if they were interacting with the void, which creates a sense of detachment from their classmates.

"For the most part, Gather.Town doesn't feel hollow compared to Zoom. By that, I mean it just doesn't feel like I'm alone in my room. I'm doing more than just staring at my computer screen and sometimes muting and unmuting myself to speak. I believe the avatars play a big role in that and also the fact we have to move to our own separate tables to speak."

Breakout rooms were the mechanism to get the groups together in Zoom for teamwork; some students found it inconvenient to go back and forth between the breakout rooms and the class window to reach out to the instructing team; While in Gather.Town, they are students could go to the instructing team or their teammates by walking around or using the "following" feature.

"In a Zoom breakout room, it is impossible to interact with the rest of the class, whereas, in Gathertown, you are able to go into different rooms, go to the podium, make announcements to the entire class/professor whenever you want. Much more interactive and much less of a waste of time."

"In Gather.Town, it is easier to get the attention of the professor or a TA instead of leaving a breakout room and rejoining every time."

Students also stated that they were more engaged and had fun with the virtual class when they were given game-like surroundings with personalized avatars. For example, one student said:

"The fun ability to be able to personalize your character! It gives it some exciting aspects to the environment and makes it not as bland as zoom."

These parallels with 2D gaming environments offered them a clue of what they could accomplish in the environments, and pop-ups let them traverse the environment with less uncertainty. Another student stated:

"The pop-ups allow for easier knowing what to do."

Another affordance that students found appealing about Gather.Town was the whiteboard, which was mentioned often in the students' comments. They've made a lot of suggestions and comments on this element's functionality. For example, students said:

"It gives the illusion of talking at a table with others, but we have also utilized the whiteboard within our room, which was useful."

"Have not been able to effectively use the whiteboard. (Infrastructure gripe) It is very resource-intensive and stalls the connection frequently. From what I have been able to see, it should definitely include some kind of online code editor for pair coding."

"The whiteboard could function better if it had a maximum size, as you can scroll left and right, and while it is nice to work together on different spaces, it's hard to know where to go sometimes."

In general, the presence of familiar and similar physical classroom features has made the setting more perceptible and enjoyable for students.

V. CONCLUSION AND FUTURE WORK

Learning experiences involve interactions with instructors and peers. These interactions can be influenced by the environment where the learning takes place. The COVID-19 pandemic introduced a shift to the mode of learning from physical to virtual, raising questions about the design of the learning experiences in both modalities. In this study we aimed to understand the student online learning experience when using video conferencing versus a virtual world. More specifically we were interested in identifying factors to guide the design of online learning experiences. We surveyed 34 students who used two different environments for online learning to identify their positive and negative experiences. Our analysis showed that virtual worlds provide spatial affordances that contribute to positive learning experiences. Students found the experience offering them a sense of presence and a self expression that did not exist in a video conferencing environment. They also attributed the visual clues, such as having a sense of what others were doing, contributing to more productive and effective interactions with classmates, teammates, and instructing teams. Virtual worlds provide many opportunities that parallel the physical classroom environment. This provided students with a sense of familiarity that contributed to a more enjoyable and engaging experience compared to a more isolated experience in the video conferencing learning environment. In addition to a real world resemblance students also found the virtual world reminding them of video games they played outside of the classroom which gave them a sense of fun.

Understanding the differences between video conferencing and virtual worlds as a learning environment in terms of students' learning experience can provide guidance when designing online learning experiences. Providing students with opportunity for self expression, a sense of presence, and control of the interaction can enhance online learning experiences. Our study surveyed students in a project-based learning course about their experiences in Gather.Town and Zoom. These students expressed their appreciation of the affordances provided by avatars, tables, and other indicators that support teamwork in a physical classroom. A limitation of our results is that the students were participating in a project-based course and therefore would appreciate affordances for projects and teams. If we surveyed students in a predominantly lecture-based course we would expect to receive different answers. We present our results as relevant for designers of online learning experiences in project and team based learning in providing student perspectives to consider in their selection and design of online learning environments.

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