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Implementation of VoiceThread in Online Aviation Education: A Pilot Program Towards Creating Community

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VoiceThread is an online multimedia and multimodal platform used by educational institutions across the world. The researchers in this paper implemented VoiceThread in Aviation Education to create a sense of community and decrease feelings of student isolation when taking online courses. Participants surveyed were undergraduate students majoring in a variety of degree programs in Aviation Education. All participants were enrolled in an asynchronous online Ethics & Professional Responsibility course. Enrolled students participated in VoiceThread assignments, creating original slides, recording themselves discussing the topic in an audio and visual format, and responding to their peers with video and audio comments. The researchers analyzed quantitative Likert scale items and qualitative open-ended questions. Participants reported feeling engaged and described the course as interactive when asked to describe their course environment. Additionally, they report feeling less isolated because of VoiceThread, increasing their sense of community in the course. Finally, students were asked what challenges exist for building an online community in Aviation Education, and how instructors can further support the community in their online courses. The results indicated that students were aware of the difficulty of creating community in online courses, either due to schedule restraints, motivation, and/or availability of peers, and course design limitations. Students identified VoiceThread as a good EdTech tool that helped foster community in their course and appreciated the opportunity to interact with their peers. Many students recommended that educators create an online learning environment that leaves space for community building, either in relation to the content, group work, and required course activities, or via informal interactions to create "outside-of-class" opportunities for students to spontaneously create their own community. Overall, the researchers were encouraged by the student responses and reiterate the need to create a sense of community in online Aviation Education courses.

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Introduction

Aviation Education, especially in the collegiate environment, has a long history of being multi-modal in its instruction and content delivery, including face-to-face, hybrid, and pure distance and online courses (Scarappelini & Bowen, 2001). Most well-known schools that offer aviation related curriculum in the United States have offered asynchronous online education for a variety of reasons. Additionally, undergraduate enrollment in online courses continues to grow even while overall enrollment trends downward (Bright & Vogler, 2024). While many traditional programs and students have grown accustomed to offering and taking online courses, many students have had little other choice, especially in aviation. There are countless examples of non-traditional students enrolled in online courses, such as those working full-time to fund flight training, taking night classes, serving in the military, balancing work and parenting, or graduate students seeking additional higher education from prestigious universities without needing to relocate or put their careers and families on hold.

In this paper, Aviation Education is an umbrella term that covers courses and programs in Airport Management, Air Traffic Control, Aviation Management, Dispatch, Professional Pilot, and more. While we do not sample from every facet of aviation in this research, we acknowledge that the field is wide and encompassing. This field, by its very existence, is inherently multi-disciplinary. It includes not only many topics from a variety of academic fields, such as the physical sciences like physics and chemistry, but also fields such as psychology and medical science. Aviation Education also resembles other fields that include hands-on education, such as Medicine (e.g., physicians, nurses, etc.). Both Medicine and Aviation, just as one example to illustrate the larger point, use a variety of different modalities, including lectures, simulators, and labs. Also, students in Aviation Education come with diverse skills, background knowledge, and life experiences that enrich their learning.

Educational technology has made many refinements from the first, solely pen and paper distance and correspondence courses. Gone are the days of receiving a packet of correspondence material in the mail and sending it back with the postman. Those distance courses of yesteryear were lonely and self-isolating, as even interaction with the instructor of the course was limited. Today, courses with interactive videos, assignments, and student interaction are in the education zeitgeist. The focus on the three touchpoints of engagement is now at the forefront of online course design. At the core of the development of online university courses are three questions: how do students engage with the content, how do students engage with the instructor, and how do students engage with one another.

Inherent in online Aviation Education is the idea that students come from a variety of fields to learn about aviation overall. Therefore, classes must be designed and tailored to bring many different types of people together to learn about aviation education. Research in Online Education shows that students are more engaged in courses where there is a social component (Garrison et al., 2000; Whiteside et al., 2017; Russell & Murphy-Judy, 2021). The focus on that third question, how do students engage with one another, becomes more important and valuable to students. As technology advances, there are more and more tech tools for education, sometimes referred to as EduTech or EdTech (Educational Technology) (Robinson et al., 2008) or te(a)chnology (teaching technology) (Russell & Murphy-Judy, 2021). In this paper, we

explore the use of the EdTech VoiceThread and its capacity for creating community in Aviation Education courses. This paper contributes to the pedagogy research in online Aviation Education, focusing on the implementation of VoiceThread, a specific online pedagogical tool, in online Aviation Education courses.

Research Questions

This paper centers around the following research questions: Does the implementation of VoiceThread in Aviation Education 1) positively influence students' opinions of online classes and 2) aid in limiting the sense of isolation in fully asynchronous online courses? 3) Do students view VoiceThread as a positive pedagogy tool for online courses?

This paper examines the initial implementation of VoiceThread in online distance-based Aviation Education and the student response. The researchers used questionnaires featuring Check All That Apply items, quantitative Likert scales, and open-ended qualitative prompts to address the research objectives.

Literature Review

Previous Aviation Online Research

Delivering quality Aviation Education courses has long been a goal. Scarappelini and Bowen's (2001) paper on distance education in aviation emphasized that pioneers will "recognize the constantly shifting framework surrounding distance education" (p. 158). At the time of their research on aviation distance education, more than 17 universities were known to have offered online courses. Only 6 years later, in a survey on Distance Learning in Aviation, Prather (2007) offered updated insight that 25 institutions were offering online academic courses in aviation, a 30% increase from Bowen. At the time of writing, the authors have a hard time imagining an educational institution that wouldn't have online courses at least as an option for a single course, if not many.

In recent years, since the initial peak of the COVID-19 pandemic, when higher education briefly turned its delivery model to almost entirely online, much scholarly work has been published in aviation journals regarding distance and online aviation education. A small example of authors researching online aviation education have studied a variety of perceptions and sentiments regarding online student satisfaction (Ani, 2024), effectiveness of virtual classrooms (Dattel et al., 2021), student motivation in online asynchronous courses (Wilson & Stupnisky, 2022) and many other research vectors rooted in some form of educational psychology. However, while these and other similar articles mention the types of software or platforms that are used, they are not the primary tool under investigation. As an example, Zoom or Skype are often mentioned to replace a traditional face-to-face lecture, but those tools and the students' reaction to them aren't the researcher's primary investigative focus.

VoiceThread

VoiceThread, a multimedia, multimodal web-based application, has been widely adopted by a wide variety of academic institutions (VoiceThread, 2025). The application was developed at the University of North Carolina and is an online application that allows users to create and share interactive multimedia slideshows (Brusini, 2013). Users can upload their own media slides (PDFs, PowerPoints, Canva slide decks, etc.) and then narrate those slides within the platform. Users can choose to narrate one slide at a time or flip through the slides as they narrate. There is also the option to annotate and draw on the slides as narration is being recorded, to highlight or outline important information on the slides presented. Once a slideshow is created, the application also allows others to participate, allowing for pair, group, or community discussion, transforming the educational platform into an interactive and engaging digital classroom (Features, 2025). These features and interactivity make VoiceThread "a valuable tool to support online active learning" (Zheng et al., 2017, p. 996) and an ideal tool to implement in Aviation Education courses to create a sense of community and belonging in the online asynchronous classroom.

VoiceThread in Education

The VoiceThread tool was not specifically designed as an education tool (Kent, 2017), but the company has been working in collaboration with educators to improve the tool's features for educational use since its early days. This co-authorship with educators helped to shape what the tool is today, including its praised accessibility features (Pacansky-Brock & Ko, 2017). The educational benefits also became apparent early on (Brunvard & Byrd, 2011; Stover et al., 2015). In 2015, VoiceThread was seen as an emerging and "exemplar technology that allow[ed] readers and writers to engage with texts in multiliterate ways" (Stover et al., 2015, p. 342), demonstrating the tools capacity for applications in education.

VoiceThread is also available for pre-K-12 education and institutions internationally, such as the Southern Cross University in Australia, Open Universities Australia (OUA) (Chen & Bogachencko, 2023), and the National Aviation University in Kyiv, Ukraine note that VoiceThread is useful for teaching English for Specific Purposes (ESP) courses (Konoplianyk et al., 2021), and have adopted the tool. At the launch of New VoiceThread in 2023, the company described VoiceThread as making "interactions online warmer and more 'human-centric", emphasizing the platform's value as an educational tool that fosters connection, community, and human-centered communication (VoiceThread Blog, 2023; Bickle & Rucker, 2018).

VoiceThread in Aviation Online Education

Over 40 of the top 100 institutions have adopted the use of VoiceThread (VoiceThread, 2025), and the tool continues to be a popular choice among educators and students. A web search provided a short list of well-known aviation universities that are current users of VoiceThread. These universities are the Embry-Riddle Aeronautical University, Kansas State University, University of Nebraska at Kearney, and University of North Dakota. There is no published data on whether these universities are using them in aviation-specific courses, however. There is a dearth of scholarly research regarding online aviation education and VoiceThread in particular.

More specific research has been done on pedagogical tools in online aviation classrooms, such as synchronous chats (Walden, 2020), and utilizing a free communication platform that is used for text, voice, and video chat, such as Discord, to build an online community of scholars (Walden, 2023). Mrusek and Brito (2018) delivered a presentation on utilizing VoiceThread as a discussion board replacement in online courses and concluded that the tool can improve learner engagement and collaboration in aviation and aerospace education. After a thorough review, no published peer-reviewed articles exist regarding VoiceThread and its impact on online aviation education.

Social Presence with VoiceThread

As technology has advanced, so too have the expectations of our students and the way in which they perceive social presence. Orlando (2011) identified the benefit of improved social presence when VoiceThread was incorporated into online asynchronous classrooms, explaining that "students find that the ability to see and hear their instructors and classmates improves the sense of social presence of others in the classroom" (p. 4). Pavlou (2024) posits VoiceThread as a key tool that supported their students' growth, both individually and as a community of learners, and enhanced research and student-instructor engagement in asynchronous activities that supported their "Arts-in-a-box" distance learning courses. Chen and Bogachenko (2021) compared text-based Discussion Board interactions to VoiceThread's multimodal platform, finding that VoiceThread created stronger social presence, continuous and inclusive communication, more personalized communication (users identifying one another by name), and that the platform is an effective tool for online collaboration and engagement. Their study identified a Social Presence Density (SPD) (participants' expression of emotions, use of humor, references to one another's messages, etc.) to be more than twice as high in VoiceThreads as on text-based discussion boards (Chen & Bogachenko, 2021, p. 69). Their study reconfirms Bickle and Rucker's (2018) findings that VoiceThread significantly contributes to students' feeling of community, ability to learn and communicate in asynchronous online courses and Ching and Hsu's (2013) findings that VoiceThread helped students connect with their peers and to communicate emotions and personality which allowed them to better interpret meaning and that there was a high level of preference for VoiceThread over discussion boards among students. Chen and Bogachenko's (2021) findings also strengthen the findings of Lawrence-Benedict et al. (2019) that a drop in student perceptions of discussion boards as a viable way to create community in an online sport management graduate program between cohorts in 2014 and 2015 could have been attributed to the implementation of VoiceThread during the 2014-2015 academic year. With social media platforms like Instagram and TikTok, it comes as no surprise that students have shown a growing preference for video platforms like VoiceThread over text-based discussion boards.

The literature indicates that VoiceThread's value is in community building, student-to-student, student-to-instructor, and student-to-content engagement, and as a foundational tool for enhancing in-person and online academic spaces, which directly contributes to creating a sense of belonging in online education programs.

Methodology

Rationale for Implementation

The instructor designed their online courses with the use of VoiceThread to encourage students to discuss and rehearse the material verbally and physically by having them record themselves and upload their recordings for other students to view. Taylor and Hinchman (2020) suggest that students are able to practice performing and teaching a skill while being recorded. Therefore, the instructor placed an extra emphasis on requiring that students use VoiceThread to record themselves with both video and audio. Finally, this VoiceThread design was selected so that the students were required to watch and comment on at least two other students' posts in an attempt to allow the students the opportunity to hear from other students' perspectives. In essence, students were listening, speaking, and practicing the course material at least three times by the end of the submission timeframe. The rationale was to allow the students the opportunity to review and critique each other as a way to increase student engagement in the cognitive and social realms (Taylor & Hinchman, 2020).

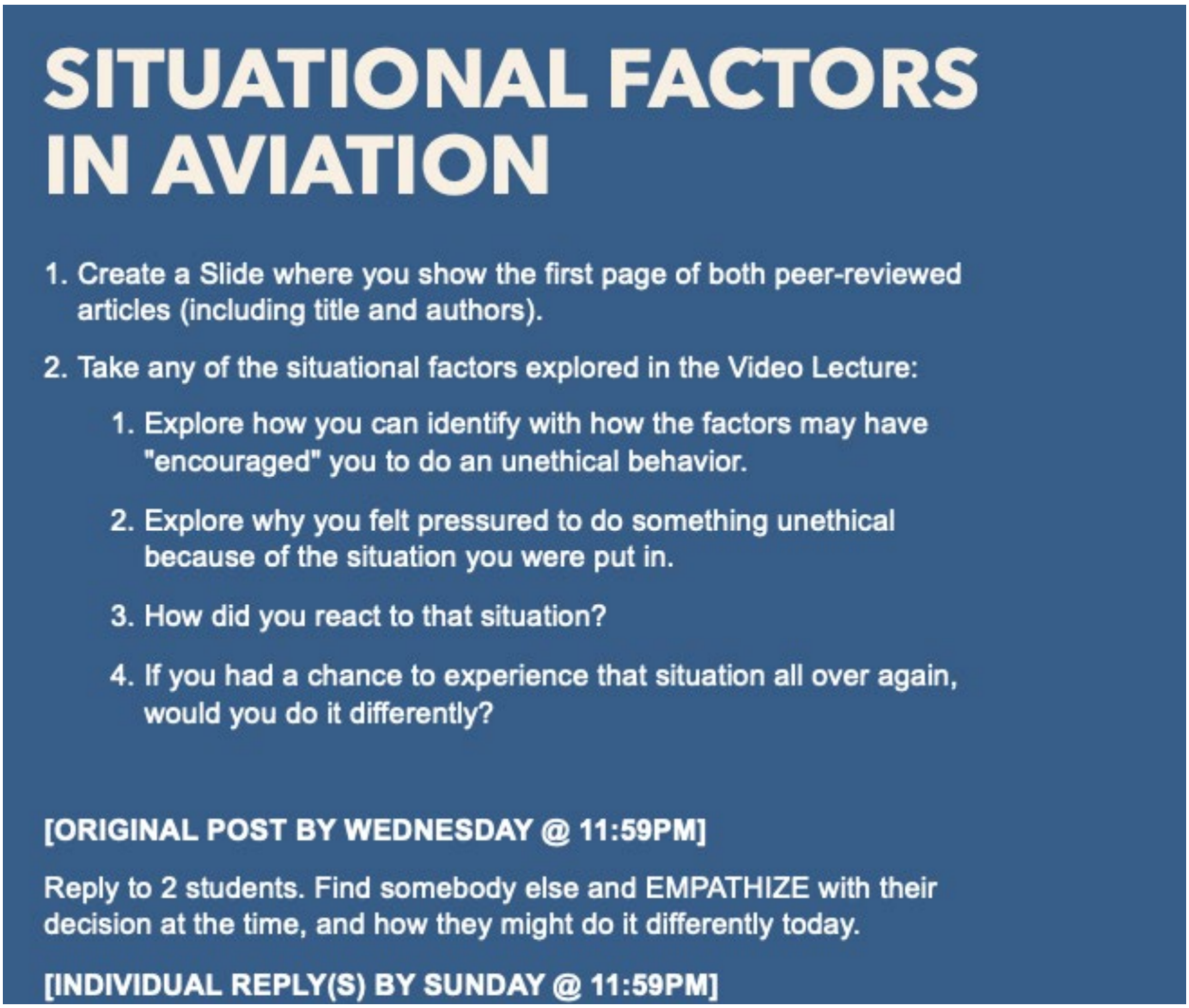
Aviation Education in particular places great value on the educational psychology principle of rehearsal. Those familiar with pilot training will understand the term chair flying, which refers to practicing and rehearsing maneuvers using mental imagery (Hudson, 2023). Research outside of aviation suggests that rehearsing material (Greene, 1987; Oberauer, 2019) and recording oneself can help with long-term memory retention (Noice & Noice, 2006). More research needs to be done on the impact of video-based discussion posts and its impact on social presence and course satisfaction (Xiu & Thompson, 2020). In concurrence with Thompson et al. (2017), the implementation of VoiceThread in this course was not intended to be the originator of learning, but simply a tool to promote learning. Recent research by Ng (2022) in online aviation education has shown that collaboration, even when asynchronous, is important in online learning environments, and tools such as flight simulators and web-conference software allow students to communicate and collaborate in an online community.

Implementation of VoiceThread in Aviation Education

The instructor chose to implement VoiceThread in a way that resembled a traditional post-and-reply format similar to those seen in discussion boards, but with the component of audio-video contributions replacing written words. Additionally, the choice to resemble traditional discussion boards was to add familiarity to the course structure, while implementing a new tech tool to help further retain the lesson (Comer & Lenaghan, 2013). Student participants were required to watch a separate video lecture and read any assigned articles. Afterwards, they were to make a video post, recording themselves in an audio and visual format each week by Wednesday, then asked to respond to other students in the class. Typically, they were asked to make a slide either from PowerPoint or Google Slides and upload it to the class VoiceThread, narrating it themselves, discussing the finer points of their assignment, such as a major theme in that week’s readings. After students made their original VoiceThread posts, which included the slides and narration, they were required to view other students’ VoiceThread slides and narrations and to make two replies by the Sunday following their original post. An example of the prompt is shown in Figure 1.

In this way, students who were familiar with online distance courses would be accustomed to the twice-a-week deadline and structure of the discussions, while getting used to the new platform. Additionally, this style of VoiceThread was easy to implement, as the instructor was familiar with using traditional discussion boards in their previous online courses and found it easy to adapt those discussions to this new technology and format.

Figure 1.
Example Prompt in VoiceThread



Participants

Participants were students enrolled as undergraduate aviation majors (e.g., professional pilot, aviation management, professional aviation) at a midwestern university. The participants were enrolled in an upper-level, asynchronous online Ethics & Responsibility course offered by

an aviation professor in the Spring 2024, Summer 2024, Fall 2024, and Spring 2025 semesters. The participants were enrolled primarily in either face-to-face, hybrid, or online undergraduate programs. Students were free to enroll in either the online course or one of the face-to-face course sections offered on campus.

The participants skewed slightly more female (52%) than male (48%). Among the participants, 2 (4.3%) were freshmen, 7 (15.2%) were sophomores, 16 (34.8%) were juniors, and 21 (45.7%) were seniors. 67 students were surveyed in total, but only 46 completed the entire survey. Those who didn't complete the entire survey were excluded from analysis for a n = 46. The total students who were given a chance to complete the survey was 95, with a total completion rate of 50%. See Table 1 for descriptive statistics of the demographics.

Table 1
Demographics of the sample (n = 46)

Variable	n	%
Gender		
Male	22	47.83%
Female	24	52.17%
Year in College		
Freshman	2	4.34%
Sophomore	7	15.21%
Junior	16	34.78%
Senior	21	45.65%

Procedure

For the purposes of the research survey, each class, every semester, used VoiceThread in the same way (see implementation section above for an in-depth discussion). At the end of the semester, they were asked to answer questions in an untimed, self-report survey hosted by Canvas, the university's Learning Management System. The survey asked questions regarding the general class climate related to online courses, as well as questions specifically about the implementation of VoiceThread in the course. The participants were asked to answer questions in three different formats: 1) check all that apply, multiple choice, 2) survey rating scale from 1-10, and 3) open-ended questions. The blend of quantitative and qualitative data was chosen as a deeper understanding of the student experience was desired. The data was best examined using a mixed-methods approach. Descriptive statistics utilizing frequencies and percentages were compiled and charted for the quantitative analysis, while the qualitative analysis was explored

using a Thematic Analysis paradigm to guide the research. Braun and Clarke (2006) identify Thematic Analysis as a popular and appropriate qualitative research method for analyzing data that searches across a data set to identify, analyze, and report repeated patterns. The three goals of Thematic Analysis are to identify important themes from the data, to understand how the themes relate to one another, and how themes can generate new insights about a particular phenomenon (Nowell et al., 2017). The survey, questions, and data were compiled and recorded in compliance with the Institutional Review Board at the institution.

Results

The first check all that apply style questions pertained to the online environment of the course, VoiceThread in particular, and their sense of isolation or community while taking the course.

Students were asked about new online skills that they learned after taking the course. A total of 23 (50%) enjoyed the VoiceThread discussions and lectures, while 21 (54.3%) felt that they learned how to exist in a community in an online course. 11 participants (23.9%) indicated they learned new skills and knowledge in an online setting. Interestingly, no participants (0%) reported that they did not learn anything new. See Table 2 for full descriptive statistics of the choices and responses.

Table 2
Results pertaining to Online Skills Gained After the Course

After taking this course, … (select all that apply).	Frequency	%
I learned a lot of new skills and knowledge in an online setting	11	23.9%
I learned about new technology that I can use in my courses	25	54.3%
I learned about how to exist in a community in an online course.	21	45.7%
I enjoyed the VoiceThread discussions and lectures.	23	50%
I learned a few new things.	31	67.4%
I did not learn as much as I had hoped.	2	4.4%
I did not learn anything new.	0	0%

Note: This question has multiple responses as a Check All That Apply

Students were asked about what preferences they have for courses. A total of 20 (43.5%) indicated they would take more asynchronous online courses with VoiceThread, while 16 (34.8%) indicated they would still prefer to take in-person courses. No students (0%) chose that they would never want to take another online class again. See Table 3 for full descriptive statistics of the choices and responses.

Table 3
Results pertaining to Course Modality Preferences

This course makes me think… (select all that apply)	Frequency	%
I want to take more online courses in an asynchronous (non-scheduled) environment.	7	15.2%
that I want to take online in a synchronous (scheduled) environment.	5	10.9%
that I still prefer to take in-person courses.	16	34.8%
would take more asynchronous online courses like this one (with VoiceThread interaction)	20	43.5%
I never want to take another online class again.	0	0.00%

Note: This question has multiple responses as a Check All That Apply

Students were asked about their comfortability in the environment of this online course. 17 (36.9%) selected Yes. 10 (15.2%) indicated that after getting to know their classmates it was easy to work and participate. 8 (17.4%) said they still do not like to participate in group discussion, while 7 (15.2%) said it was easy to participate in classes. Only 1 (2.2%) checked that they were embarrassed or nervous in class because of other students. See Table 4 for full descriptive statistics of all the choices and responses.

Table 4
Results Pertaining to Online Course Environment

Did you feel comfortable in class as though the environment was easy to participate in?	Frequency	%
Yes	17	36.9%
Yes, after getting to know my classmates it was easy to work with them and participate.	10	21.7%
Yes, but it is always easy for me to participate in classes.	7	15.2%
Yes, but I still do not like to participate in group discussions	8	17.4%
No, I felt embarrassed or nervous in class because of other students.	1	2.2%
No, I felt embarrassed or nervous to participate in class because of the professor.	0	0.00%

Note: This question has multiple responses as a Check All That Apply

In the second part of the survey the participants were asked to use a Likert scale from 1-10 to rate their 1) sense of community in the class, 2) importance of community overall in online courses, and 3) if VoiceThread helped to create a sense of community in the course.

The first question using the Likert scale asked about how isolated or connected students were at the end of the class. Participants reported feeling above average (M = 5.91) on the connectedness aspect. The second question using the Likert scale asked participants to gauge how important it is to have a strong sense of community in the course. Participants report the importance as being slightly below the average (M = 4.5). The last question using the 1-10 Likert

scale positively indicated (M = 6.9) that respondents felt VoiceThread was helpful in creating a sense of community in the course. See Table 5.

Table 5
Likert Scale Questions

Question	Mean	Std. Deviation
On a scale of 1 to 10, where 1 is isolated and 10 is deeply connected, please rate your sense of community in the class. When thinking about this rating, think about how you feel in the class. Do you feel (1) completely isolated and not a part of the class at all, and do not know or speak to anyone within the class, or (10) like you are part of a class environment, have met new people, and have begun to create friendships with them.	5.9	2.15
On a scale of 1 to 10, where 1 is not at all important and 10 is vital or extremely important, please rate how important having a strong sense of community is in your online learning experience?	4.5	2.51
On a scale of 1 to 10, where 1 is not at all and 10 is very helpful, please rate how VoiceThread helped to create a sense of community in this course.	6.9	2.79

Additionally, open-ended questions were asked to allow student participants the ability to provide their opinion about VoiceThread. This qualitative data was collected, analyzed, and categorized by the researchers.

For results pertaining to the open-ended question “What challenges have you faced in building or maintaining a sense of community in this online class?” see Table 6.

Table 6
Student Responses Pertaining to Challenges when Building a Community

Participant Survey #	Student Responses Pertaining to Challenges when Building a Community
7	I did not see the benefit in building a [sense] of community with the other students.
8	Different time zones make it difficult for me.
10	My shyness can get in the way sometimes.
11	Easier to connect when you can record at any time.
12	Introduction slides helped me meet people.
17	I faced the challenge of not wanting to record myself for an extended time.
20	There isn't any continued conversation (like "respond to comments made on your video" or something of the like).
22	The voice threads were the only assignments where we got to interact with each other.
30	Ensuring everyone is supportive with their posts and not demeaning.
31	The aspect of the social environment in an in-person class, like before and after class, and meeting people face-to-face.
32	There simply isn't time or space for community.
35	Still hard to have a sense of community when you never actually see other people in this class other than through a screen.
40	This class is online.
45	The challenge was due to being a full online student, and this class was online. I don't go to the campus for classes anymore, so most people I meet are strangers. I enjoyed doing this class online, but I also think being in person for this class would have fostered more of a community feeling.

Note: The chart above is a selection of participant responses that highlight common themes found in the data.

As seen in Table 6, student responses to challenges they faced when building community in their online course indicated the common themes of time, motivation, format of the course, and engagement opportunities throughout the course. Many students indicated that there was no time for community building, either due to their own schedule restraints, motivation, availability

of peers in different time zones, or due to the constraints of the class structure and content design. Overall, students compared their course with face-to-face courses and a spontaneous community that is built during "hallway time", before and after class interactions, studying with peers met in class, and meeting in person. This could indicate the need to create "hallway spaces" in an online course, such as activating the chat room on the LMS so students can chat with others who happen to be online with them at the same time, the creation of an open-ended forum for students to engage outside of class content, or the creation of a "study room" via a link to a virtual room where students can visit synchronously on their own time. Students indicated the desire for these types of elements when responding to the question "How do you think instructors can support the development of a strong community in online classes?", as represented in Table 7 below.

For results pertaining to the open-ended question "How do you think instructors can support the development of a strong community in online classes?" see Table 7.

Table 7
Student Responses Pertaining to How Instructors Can Support Community

Participant Survey #	Student Responses Pertaining to How Instructors Can Support Community
14	I think making classes interact over videos makes it a lot better of a community vibe.
15	Group assignments and discussions help people collaborate.
18	Using apps like VoiceThread.
24	I have no idea for developing a strong online community. Maybe having extra questions, like a favorite animal, would help.
28	By creating spaces for students to converse with one another, like a Teams chat or a Discord server. Not by forcing abstract communication via discussion threads.
32	Instructors can host more Zoom meetings with other students, even just optional hangouts or group tutoring.
41	Nothing, it's the nature and purpose of an online class, so that you don't have to go, and you can do it on your own by yourself.
42	By making more assignments about personal experiences and stories.
44	It would be interesting to assign students to contact two other students to work on a project together. Or perhaps make an assignment [where] 3 students all need to voice call each other [and] record their conversation about a certain topic while answering questions. This idea only comes about because the discussion post methods always feel hollow. At least with the idea above, there's some real communication happening, not just posts and replies.
45	Maybe by having regular check-ups throughout the course with everyone, whether that is together on a Zoom call or putting people in groups for assignments. I think that could [develop] more of a stronger community for online classes.

Note: The chart above is a selection of participant responses that highlight common themes found in the data.

Students also offered ideas for how instructors can create community in online classes. Table 7 shows a sampling of student responses to this question, reflecting common themes in the data. As reflected by participant 24's comment, "I have no idea for developing a strong online community", many students opted out of answering this question on the survey. However, many students recommended optional Zoom sessions, Discord or Teams Chat threads to create an

"outside-of-class" type space for students to interact informally, group projects, live, optional study sessions, or informal hangouts via Zoom, and the use of technology to encourage the sharing of ideas. Students' skepticism on the capacity of online classes to create community shined through this question as well, as seen in participant 41's comment "it's the nature and purpose of an online class so that you don't have to go and you can do it on your own and by yourself" which can also reflect the motivations for students who choose to take their courses online. Comments like these can indicate that some students strategically choose online courses in order to avoid engaging with others and to work through the material on their own. These findings can be very useful to faculty when creating online courses, taking into account the suggestions from students to create "third spaces" for informal interaction, selecting EdTech that suits their teaching style and goals, and designing their courses with community and content in mind.

Finally, we analyzed an open-ended question on perceptions of Class Atmosphere using a generated WordCloud to gain insight into students' unscripted opinions. In Figure 2, we present a WordCloud generated from student responses to the question "In one or two words or a short phrase, how would you describe the class atmosphere and learning environment?"

Figure 2.
Word Cloud for Class Atmosphere

*Word Cloud created using www.wordclouds.com

The Word Cloud for Class Atmosphere shows students' sentiments regarding the course. Words that are larger indicate more students used those words in their responses, while smaller words signify fewer students wrote those responses, some as few as only one. The most common words indicated by the students in this response were Engaging, Comfortable, Relaxed, Important, Thoughtful, Good Learning Environment, and Challenging. These positive reflections illustrate that many students were satisfied with the course overall and found it to be meaningful and engaging.

Conclusions

Survey results found many interesting conclusions about the implementation of VoiceThread and students' desire to continue enrolling in online classes. Every student left with new knowledge, either pertaining to the course content, how to build community online, or new tech tools (as demonstrated in Table 2). Many students indicated that they enjoyed using VoiceThread and that they would be interested in taking another class utilizing VoiceThread (as demonstrated in Tables 2 and 3). This is encouraging and positions VoiceThread as a useful tool for online course instructors.

When students described their online course environment, they used words like "engaging", "creative", "encouraging", "thoughtful", and "interactive" (see Figure 2). Multiple students even indicated that there was a "good" or "great" learning environment, showing the capacity of VoiceThread to help facilitate a positive learning environment. These qualitative results also align with quantitative responses (shown in Table 4), where students responded that they were comfortable in the online environment facilitated by VoiceThread, and others felt more comfortable after getting to know their peers through the platform. These results demonstrate VoiceThread's capacity to help foster a positive learning environment where students can get to know one another, even in a fully online, asynchronous course.

When students were asked to compare this course with other courses and to identify strengths and weaknesses of community in other online courses, students continued to reflect on the lack of time and motivation for other students to invest in community building, how instructor presence impacts the sense of community, and how synchronous sessions with instructors and peers in group work helped to foster community (as reflected in Table 6). Some students also indicated that their other online classes did not encourage interaction with their classmates and that this course was their first time with a platform like VoiceThread, indicating its contribution to their sense of community. Many students commented on other online courses being text-based, lacking real-time interactions, lacking audio-video participation, and lacking instructor presence and encouragement to engage with one another. Students indicated that they appreciated when teachers attempted to foster an environment of community within their classes. These comparisons in the open-ended responses of students surveyed could indicate a desire for community building in their courses and a need for instructors to design their courses with this in mind, despite many indicating that community building was not a high priority for them in online courses (Table 5).

Many comments reflected students' skepticism in the possibility of building community in online courses (Table 3 and Table 6), one student simply responding "This class is online"

(Table 6), which seems to indicate the format of the course as being the restricting factor. However, these comments could also indicate that we as educators need to be more creative with how we use and implement EdTech, thinking strategically about elements that are for community building (i.e., welcome week VoiceThreads where students create slides about themselves and interact), elements that are for the course material (i.e., interactive VoiceThread lectures where students engage with the instructor and content), and elements that are incorporated to foster student-to-student engagement (i.e., small group discussions on VoiceThread with back-and-forth conversations over a two-week period). Students left meaningful recommendations for instructors on how to build community in online classrooms, indicating a desire for community building (as seen in Table 7).

Implications

It is interesting to the researchers that participants in this survey did not find a sense of community to be of great importance. When asked the question "How important is a sense of community in an online class?" respondents averaged 4.5, slightly less than a neither important or important rating. It is known that students choose different modalities (online, face-to-face, etc.) for a variety of reasons (O'Neill & Sai, 2014; McIntyre et al., 2023). Perhaps the students' reasons for taking online classes mean avoiding a sense of community or being forced to participate in other students' discussions. Or, perhaps a reason for taking online courses is to work on their own schedule (McIntyre et al., 2023), which may limit or reduce their efforts in contributing to community building or non-required elements of the course. Another possibility is that student expectations for certain types of courses are different from others. For example, students in an Ethics and Responsibilities course may not view community building –or interaction with their peers– as a necessary component of their course, while students in humanities-based courses, like Foreign Language Courses, may expect oral and peer engagement to practice the target language, a key component to American Council on the Teaching of Foreign Languages (ACTFL, 2024) guidelines for target language output opportunities in Foreign Language Classrooms (Russell & Murphy-Judy, 2021).

However, as indicated through their scalar ranking, participants reported not feeling isolated in the class, but also not feeling like they made deep connections where they made friends in class. This could be explained in many ways: the design of VoiceThread's post once and reply to two peers method which did not simulate a back-and-forth discussion as was hoped, the need for more opportunities for students to engage spontaneously (i.e. outside of assigned participation), the need for opportunities for students to share about their personal lives and experiences, creating the opportunity to connect with other students with similar experiences, or, perhaps, very simply, that students did not desire to make deep connections in an online class and therefore did not engage in a way to foster them.

In relation to the researcher's proposed research questions, it can be shown in this research that participants found that VoiceThread positively influenced their perceptions of online classes, students reported not feeling isolated in this class, and the participants responded that they felt VoiceThread was a useful pedagogical tool for implementation in online courses in Aviation Education. These results indicate that the implementation of VoiceThread was overall a

positive experience and motivates the researchers to continue exploring the use of VoiceThread in their courses.

Discussion / Future Directions

In the future, the instructor may decide to implement an alternative or modified version of using VoiceThread in their online courses. In future course design, the instructor would like to expand the use of VoiceThread to include stop-and-participate style slides, small group discussions, and other engagement styles of VoiceThread. For example, instead of requiring students to post based on an assignment, the instructor may design the VoiceThread interaction to make the students actively participate in an instructor-led lecture, shared via the VoiceThread platform within Canvas (the LMS). This can be accomplished by including discussion slides towards the middle to the end of the lecture, reinforcing student comprehension, encouraging Socratic dialogue to engage more deeply with the material, and to demonstrate active engagement/participation with the lecture material. One example might include a lecture on Aviation Ethics using VoiceThread in which the slide deck would have a 'stop and discuss' dedicated discussion question slide, requiring the students to answer questions about the ethics of the Boeing 737 MAX from an FAA regulatory standpoint.

The use of VoiceThread in these ways could unlock the potential of the platform, creating more opportunities for engagement in new ways while also providing students opportunities to engage with the instructor, the content, and one another in different ways throughout the semester. Additionally, these findings align with Chen and Bogachenko's (2021) research, which indicated that students prefer VoiceThread discussions to traditional Discussion Boards. It could be that students will engage more deeply with other styles and implementations of VoiceThreads that do not model the classic discussion board, post-and-reply-to-two-peers method. Overall, students seemed to enjoy VoiceThread and rated it as an effective tool, indicating that more research around VoiceThread's effectiveness as an EdTech tool is needed.

Due to the mixed bag of responses regarding a sense of community in online classes, more research might be done investigating VoiceThread and the retention of academic material past the end of the semester and the end of the course. One of the primary reasons the instructor chose to incorporate VoiceThread was because of the knowledge that students might record and re-record themselves speaking on camera multiple times, thereby creating a sense of rehearsal. As has often been said, "you never know a topic until you teach it." In the same way that instructors have students do end-of-course presentations to summarize the material or create a culminating class project, this implementation of VoiceThread helped to accomplish these goals, on a smaller scale, in weekly VoiceThreads throughout the course. Therefore, it could be researched how much students retained information as a result of this VoiceThread implementation.

Limitations

Due to the use of a non-validated scale and limited survey participants, it can be difficult to generalize these answers about VoiceThread to the general population. Also, this population of students was mostly homogenous, being from the same school and enrolled in programs that

generally overlap. Further research might focus on expanding the sample size to a larger population at other aviation education institutions.

Other metrics of engagement could also be evaluated, such as student time spent participating on VoiceThreads compared to in-class participation in similar courses or time constraints within in-person courses. For example, if students added more digital content to the VoiceThread than the in-person course's allotted time would have allowed them to discuss/engage, it could be said that VoiceThread expanded the capacity for participation and engagement by removing those time constraints, as was found by Soto and Soto (2022) when they utilized VoiceThread in higher level math courses to extend in-class discussions that they ran out of time for.

Using VoiceThread to intentionally build community at the beginning of the semester, as Calvo and Hartle (2023) did in their Virtual Exchange program for preservice teachers in the US and Brazil, could greatly impact the students' level of engagement throughout the course. Examining how the incorporation of community-building VoiceThreads, along with content-based VoiceThreads and discussions, could be insightful to the value of community alongside learning.

Creating a sense of community in Aviation Education is important, as many students may never have a chance to come on campus, as they are working in remote locations and abroad (e.g., military service). Integrating VoiceThread may give students the ability to be both seen and heard by their instructor, but also by their peers, which may increase their longevity in the program and their affiliation with the university. The incorporation of audio-video interaction through VoiceThread could also lead to deeper student engagement and participation and result in better learning outcomes (Delmas, 2017). Other researchers have also found that VoiceThread has the capacity for higher engagement in their courses (Kent, 2017; Padilla & Kreider, 2018; D'Alessio et al., 2019; Calvo & Hartle, 2023), indicating the benefits of continuing to explore the potential of VoiceThread in Aviation Education courses.

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