SUNTEXT REVIEWS

SunText Review of Arts & Social Sciences
ISSN: 2766-4600

Open Access
Research Article
Volume 3:1

Learning from Traditional Methods Compared to Non-Traditional with Technology-Enhanced Tools during COVID-19 Pandemic

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Received date: 12 December 2021; **Accepted date:** 16 December 2021; **Published date:** 26 December 2021

Citation: Boehm CM (2021). Learning from Traditional Methods Compared to Non-Traditional with Technology-Enhanced Tools during COVID-19 Pandemic. SunText Rev Arts Social Sci 3(1): 131.

DOI: https://doi.org/10.51737/2766-4600.2021.031

Abstract

Traditional methods in arts and design (A&D) were designed for teaching and learning in live studios located in their institutions' campuses. Students in live studios interacted closely with instructors to work with traditional hand tools and hands-on equipment for guidance which was crucial for studio education. When the COVID-19 pandemic occurred in 2020 and 2021, some A&D studio education converted to online studio learning preventing students from attending on-campus live studios. Furthermore, it is essential to determine if these students prefer traditional methods using hand tools and hands-on equipment or non-traditional methods using technology-enhanced tools. The research question for this study: Is there a difference between the faculty and student perspectives regarding the need to increase online technology-enhanced studio learning regarding traditional studio learning in an Art & Design Program? In this study, A and D faculty (N=3) and students (N=19) were enrolled in A&D undergraduate and graduate courses at a mid-sized public university in the United States during the COVID-19 pandemic in Fall 2020 and Spring 2021. Results indicated that compared to traditional studio learning, students showed more interest in learning digital skills from technology-enhanced tools. The implication with the confidence in a studio learning from a live or online studio with more technology-enhanced tools and traditional methods should be accepted as part of the futuristic career in A&D higher education.

Keywords: COVID-19 pandemic; Art and Design; Traditional methods; Digital skills

Introduction

Art & Design (A and D) studio learning in higher education has changed since the Coronavirus (COVID-19) pandemic outbreak began in 2020 and some studio education, not all, converted to online studio learning [1]. Faculty members traditionally taught studio educations in their institutions' campuses via live studios. Live studios are large open spaces for students to physically learn and experiment with their creativity in art and design [1]. Before the pandemic, faculty members introduced traditional methods to students using hands-on (non-technology) equipment and hand tools in live studios. During the pandemic spread worldwide, faculty members had to reconstruct their teaching and learning methods online remotely [2]. At the same time, academic institutions experienced closures in all fifty U.S. states, which had prevented students from being on campus to limit any potential spread of the epidemic [3,4]. Specific A and D courses like drawing, painting, photography, to name a few, can be taught easily online. However, specific challenging techniques in A&D courses such as printmaking, metalsmithing, sculpture, and ceramics as examples that use appropriate traditional hand tools and traditional hands-on equipment for traditional methods had some complications to be taught online. With A and D's traditional methods, appropriate traditional hand tools, and hands-on equipment in mind, my goal is to find ways to add digital technologies such as technology- enhanced tools for transformation to all A&D programs. All A&D programs need to adopt digital technologies with traditional hand tools and hands-on equipment for traditional methods for future hybrid education and future careers for digital skills. It is essential to determine how best to attain a hybrid education of live studio and online studio courses using technology- enhanced tools and to enhance digital skills for future higher education in every A&D program. It is ideal for this university to provide hybrid education (synchronous and asynchronous delivery methods) to all A&D programs. Specific A&D programs teach students from a live studio (face-to-face) and in an online delivery format. Furthermore, not all A&D programs can meet the need for an online delivery format [5]. Not all faculty

in A&D programs can do the online delivery format or teach students with technology-enhanced tools for their A&D courses if the faculty is not tech-savvy [5]. A&D students usually sin live studios, mainly traditional hands-on equipment, or appropriate traditional hand tools. Nevertheless, all that changed into a speedy warp because of the COVID-19 pandemic in March 2020 toward online education without traditional equipment and tools. Online education subsequently continued throughout fall 2020 into spring 2021 during the pandemic. Therefore, this study aims to determine if students prefer learning the traditional hand tools and hands-on equipment for traditional methods or enhancing digital skills by learning the technology-enhanced tools.

Studio Learning Study

From this study, it was essential to note gaps in the literature with limited studies to compare traditional versus technology-enhanced tools for traditional studio learning. Also, live studios can create barriers for online studios in the digital age for all A&D programs with technology- enhanced tools and without the necessary traditional hands-on equipment in these universities and colleges [6]. The boundaries can be regarding using technology- enhanced tools without any arms-length guidance from instructors, especially with appropriate traditional hand tools, techniques, and hands-on equipment types. However, things must change without availability from on-hand instructors and online studio education digital procedures if doing hybrid/blended courses [7,8]. Students in online studios need technology-enhanced tools to explore and experiment at their own pace, following their instructors' guidance without being in a live studio. Furthermore, not every online student has access to or afford any technology-enhanced tools. Therefore, this quantitative study included contacting all A and D students in one Midwestern university in the United States through an online survey.

Method

The university provided the Qualtrics survey links via email addresses to 241 A&D students enrolled during Fall 2020 and Spring 2021 and faculty members who taught during Fall 2020 – Spring 2021 in A&D courses. For data collection to be analyzed, this study was approved by the Institutional Review Board (IRB).

Faculty Participants

Participants as faculty' demographic for gender: two male and one female, their ages ranged from two for 40 – 59 and one for 60 – older. Faculty answered 100% yes and 0% no, which they opinionated that their A&D programs were positioned to deliver traditional face-to-face in live studios (on-campus) and online instruction. If not, I asked the faculty if they think the A&D program should be positioned to deliver traditional face-to-face in live studios (on-campus) and online instruction. The faculty members responded to the question in 100% yes and 0% no. Both questions were answered yes from three faculty members. However, this data was unreliable because the first question asked if their programs were positioned to deliver in both on-campus and online formats. In contrast, the other question asked if their A&D programs should be positioned to offer both formats on-campus and online if their answer was no for the first previous question. These faculty members were asked about their confidence in using creative teaching strategies in their courses in an online environment to instruct students and provide feedback. These three professors answered 33.33% strongly agree, and 66.67% somewhat agree. Their confidence was important to know that they were confident in their creative strategy in teaching in an online environment for their students and providing feedback to them, especially during the pandemic. With their confidence in teaching in an online environment, the A&D programs will have a future in the digital age era.

Student Participants

I sent the university's Qualtrics survey via emails to students enrolled during fall 2020–Spring 2021 in A&D courses. Participants as students' demographic for gender: 7 male and 12 female, 19 of the students' ages were ranged from 17 for 18 - 24, one for 25 - 39, and one for 40 - 59. These 14 students were non-major, four were for A&D major, and one for the A&D minor for the A&D programs during fall 2020 to spring 2021. Their year in this university was one freshman, seven sophomores, four juniors, six seniors, and one graduate student. This one survey question asked these students if they were satisfied with their A&D programs regarding creative strategies learned in their courses. They answered in 33.33% strongly agree, and 66.67% somewhat agree. Interestingly, these 19 students responded the same as the three faculty members who responded separately in their faculty survey; 33.33% strongly agree, and 66.67% somewhat agree with their confidence in using creative teaching strategies in their courses in an online environment. In the same fashion, both faculty and students did have the same confidence of agreement with the A&D programs and the creative strategies in learning.

Association in Online Environment

The purpose of this study was to find out if there was an association between faculty and students that the A&D programs provided creative teaching strategies in an online environment with effective feedback. To evaluate their confidence in these associations and determine if there was any significant difference in the population sample means, I used independent samples t- tests to assess their confidence with students versus faculty. To evaluate their mean response based on their confidence of the percentage on the

agreement, the population sample means resulted: faculty (male) M = 2.00 and (female) M = 3.00, and students (male) M = 1.57 and (female) M = 2.82. Using the Bayesian statistics because of the small population sample (N = 3) for the missing value for the faculty's t- test, I assumed that the null hypothesis might be correct with the possibility that the probability in the p-value could have the result equal or more than it demonstrated, faculty t (1) = - 0.577 [9]. However, with the missing p-value (2-tailed), I reject the null hypothesis for the alternative hypothesis because the means were not equal. Still, it was likely to be untrue [9]. There was not likely an association between the faculty and students. Furthermore, there was not a statistically significant in the population sample for the students (male) M = 1.57 and (female) M = 2.82, t (16) = - 2.232, p > .05 which failed to reject the null hypothesis. In summary of the association and an online environment, some students were satisfied with their A&D program regarding the creative strategies they learned with effective feedback during the pandemic (Figure 1).

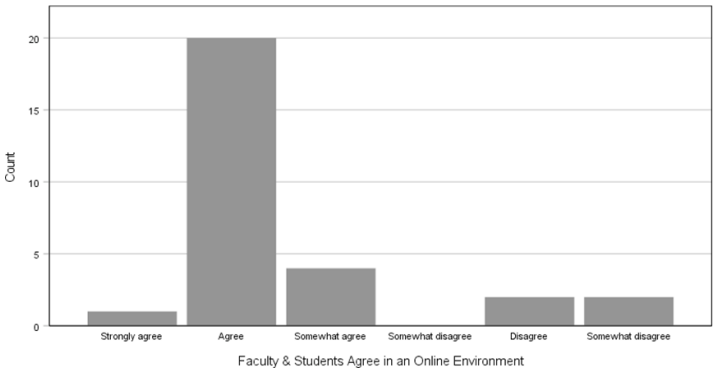

***Figure 1**: Faculty and students agree in an online environment.*

Faculty responded with 33.33 % strongly agree, and 66.67% somewhat agree, and while students gave their response as in 15% strongly agree, 55% agree, 15% somewhat agree, 5% disagree, and 10% strongly disagree. From Figure 1, the result demonstrated the faculties and students' strong agreement on studio learning with creative strategies in an online environment. With the agreement from both groups about the creative strategies' education in their online environment, this rationale for the research question is to continue the increased use of digital technology-enhanced learning tools, online resources, and online learning tools as alternatives for the traditional methods.

Chi-Square Analysis

The data from surveys, answered from faculty and students, were collected and calculated through the cross tabulation for the chi-square. The study found that faculty and students had higher percentages of agreement (yes) on agreeing to learn and use technology-enhanced and traditional hands-on tools. The Pearson chi-square goodness of fit was calculated by comparing the need to increase digital skills with faculty and students. The association was statistically significant, c2 (4) = 34.69, p < .05. The statistical test from survey questions coded in yes and no as binary variables, the chi-square testing for homogeneity was set up for the null and alternative hypotheses. Interestingly, the faculty and students differed on these binary variables: the need to redesign the A&D programs to deliver traditional face-to-face on-campus and online instruction with technology-enhanced tools, digital platforms, instructional videos, and online resources. In Figure 2, another question was about faculty members assigning instructional videos to students in their studio classes to augment in-class. Faculty answered 66.67% yes and 33.33% no that they assigned the instructional videos. Students (N = 18) responded in 27.78% yes and 72.22% no that their faculty assigned instructional videos to augment in-class. One sophomore did not answer this question, instead of all 19 participants. The meaning was that students are 5.55% more than faculty (N = 3), but this outcome may still change with a larger faculty population. To understand the graph, the faculty assigned instructional videos to students labeled for F_Yes or F_No and students labeled for S_Yes or S_No. For Figure 3, this question asked faculty if they normally assigned instructional videos to students in their studio classes to augment in-class (either in face-to-face courses or over Zoom). These faculty members mentioned that they do in 33.33% yes and not normally assigned in 66.67% no. These two faculties who responded yes were keeping up with the modernity of higher education in the digital age by assigning instructional videos for students who can pause and replay if needed to do the procedures on projects. Instructional videos or YouTube videos as online resources can benefit either in-class or online education [10]. It could be vital to ensure creativity for A&D programs in all learning environments by combining traditional and technology-enhanced methods with instructional videos, especially in the digital age. However, there were only three faculty in the sample, and the outcome could be different if more faculty accepted the participation in the A&D program. For Figure 4, one question asked students if their faculty suggested using online resources to augment in-class instruction that was not assigned. One student did not answer this question on the survey. These eighteen students answered 27.78% yes and 72.22% no for the suggestion on using online resources to augment their classwork (Figures 2-4).

The result demonstrated that students were not using many online resources in-class coursework, especially in the digital age. Online resources can be effective as engaging strategies for students' learning styles and attention span exposed to the digital age era [10]. The following question on the survey was: if the faculty was aware of your students seeking additional assistance not assigned from online sources (videos, etc.), further augment the understanding. Faculty answered in 33.33% yes and 66.67% no on their students' awareness seeking additional assistance (Figure 5).

Nevertheless, students have been using the internet since their childhood and can use it to further aid without the faculty's knowing. There were gaps and limited research regarding literature and videos as educational tools for faculty in higher education. This response rate was only from three faculty members, resulting differently in a larger sample. The last question on the survey to the groups asked if they felt there was a need to increase digital tools in studio learning in the A&D program.

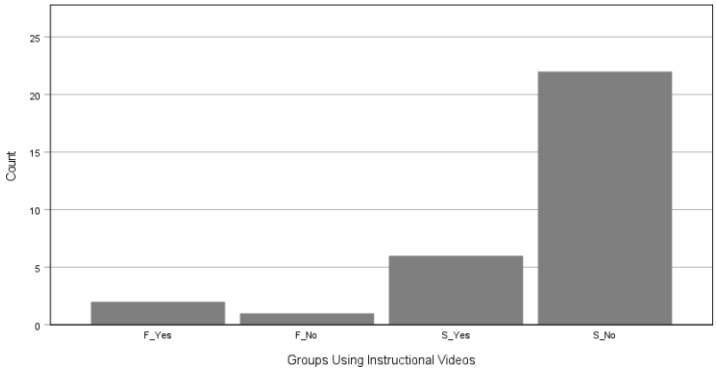

Figure 2: *Both Groups on using instructional videos.*

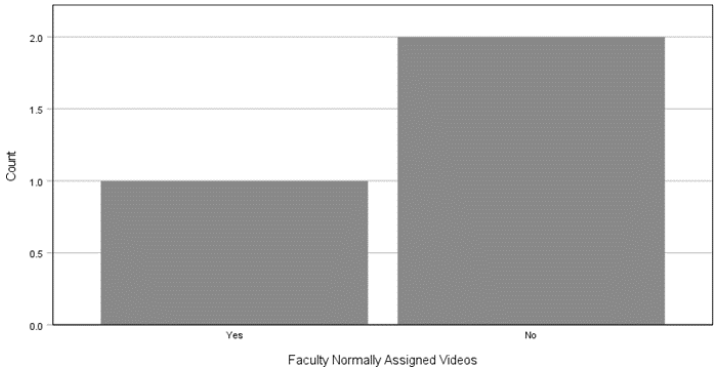

Figure 3: *Faculty normally assign instructional videos to students.*

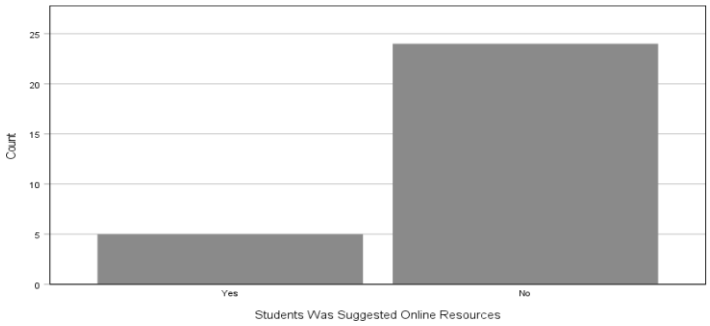

Figure 4: *Students was suggested online resources (Only Students).*

The result was to answer the research question was whether there is a difference between the faculty and student perspectives regarding the need to increase digital technology-enhanced learning tools for studio learning regarding traditional studio learning in an Art & Design Program. This study's rationale for introducing a greater use of digital technology-enhanced learning tools, online resources, and online learning tools as alternatives for better quality in less time for the traditional methods in Art & Design programs [7]. The question was asking faculty and students if they agreed that there was a greater need to increase the learning for digital skills, and the data in the histogram for both groups presented the counts in yes or no to answer. Faculty answered 33.33% yes and 66.67% no. Students (N =19) answered in 57.89% yes and 42.11% no. Students responded in 24.56% yes as more than faculty (N = 3).

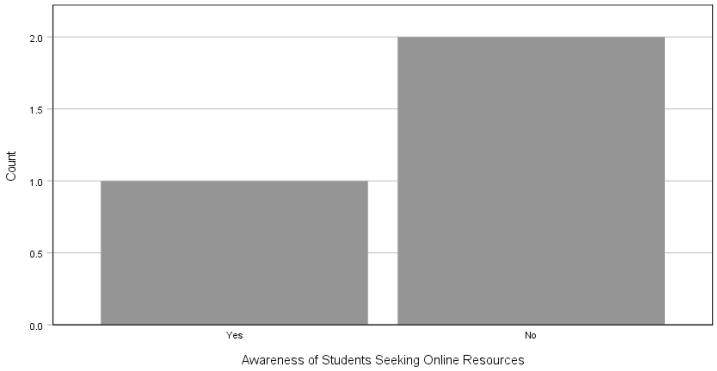

Figure 5: *Faculty's awareness of students seeking online resources.*

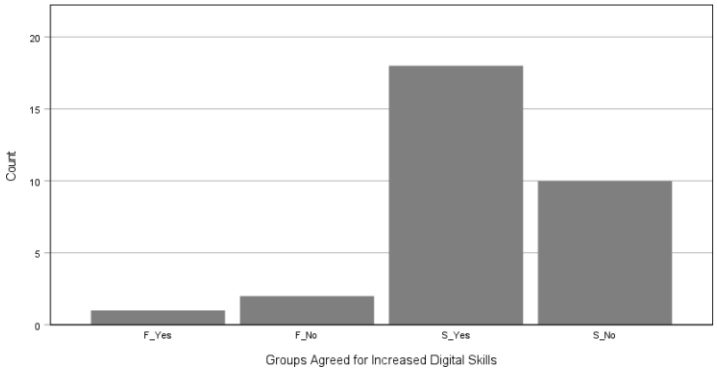

Figure 6: *Faculty and students agreed for increased digital skills.*

Results answered the research question: Is there a difference between the faculty and student perspectives regarding the need to increase online technology-enhanced studio learning regarding traditional studio learning in an Art & Design Program? Their yes or no in percentages to answer the research question. To understand the graph, the faculty were labeled for F_Yes or F_No, and students were labeled for S_Yes or S_No. The data displayed the percentage of agreement from faculty and students. The highest agreement for faculty was 33.33%, and students agreed in 57.89%. The difference between faculty and students in their agreement as yes, they agreed for increased digital skills was 24.56%. These students, considered Generation Z, have been born and raised in the digital age era, more into technology- enhanced tools than other generations [11]. However, the results might differ if a larger population for the faculty's data outcome (Figure 6).

Differences between Faculty and Students on Learning

From the independent samples t-test, t (16) = -3.194, p = .072 to show the association without any statistically significant effect. These students combined as a group for learning in the A&D program (M =2.47, SD = 1.26) have the associated larger mean compared with the faculty in teaching the A&D program (M =2.15, SD = 1.11). However, both groups' means were not statistically significant. The estimated Cohen's d was 0.27. These findings did not support the confidence as effective from the higher education A&D program to learn from online and live studio-based courses for any subject.

Survey Comparison on Faculty and Students Data

It is to know the university's faculty members' perspective on the digital age for advancing the A&D program with technology-enhanced tools and the effectiveness of traditional methods. The effectiveness of hybrid education by adapting digital age educational technology-enhanced tools with traditional hand tools and hands-on equipment can meet the higher education institutions' requirements for the 21st century [12]. According to the recent research about online education, hybrid education has been increasing more rapidly since the COVID-19 pandemic with appropriate technology applications and resources [13].

Faculty Data

These faculty members were asked about their confidence in using creative teaching strategies in their courses in an online environment to instruct students and provide feedback. These three professors answered 33.33% strongly agree, and 66.67% somewhat agree. Their confidence was important to know that they were confident in their creative strategy in teaching in an online environment for their students and providing feedback to them, especially during the pandemic. With their confidence in teaching in an online environment, the A&D programs will have a future in the digital age era. With the following four questions in the survey, I needed to find out the impact of the digital age changes to include more technology-enhanced tools with the traditional methods for their A&D programs. These faculty members have answered in 33.33% yes and 66.67% no in this question if they normally assign instructional videos in your studio classes to augment in class face-to-face instruction (either in face-to-face courses or over Zoom). Regarding whether their students were assigned instructional videos in their studio classes during the Fall 2020 or Spring 2021 semesters, the faculty answered 66.67% yes and 33.33% no. As a researcher, I needed to ask if the faculty was aware of their students seeking additional assistance not assigned from online sources (videos, etc.) to augment the understanding further. These faculty members said 33.33% yes and 66.67% no. Lastly, they responded with 33.33% yes and 66.67% no for their overall, if they feel there is a need to increase digital technology-enhanced tools in studio learning in the A&D program. Furthermore, to know more about the faculty's perspectives on digital technology- enhanced tools, these last two questions at the end of the survey required their thoughts about increasing digital tools for student learning in the A&D program. And, about their overall thoughts, if they feel there is a need to increase the students' digital skills used in-studio learning in the A&D program. I also asked them why. Only one A&D professor wrote about increasing the need to use digital technology-enhanced tools in studio learning, making a point about the future. On the faculty survey, I asked, "Overall, do you feel there a need to increase the students' digital skills used in studio learning in the Art & Design Program?" One professor answered with the "Yes" and had written the response, "While traditional studio skills are still very much the "norm," various digital skills can enhance learning and professional development for various careers in today's visual arts world." Equally important, assessments are needed to provide online teaching and learning in today's advancing digital world for the A&D programs.

Student Data

This one survey question asked these students if they were satisfied with their A&D programs regarding creative strategies learned in their courses. They answered in 33.33% strongly agree, and 66.67% somewhat agree. Interestingly, these 19 students responded the same as the three faculty members who responded separately in their faculty survey; 33.33% strongly agree, and 66.67% somewhat agree with their confidence in using creative teaching strategies in their courses in an online environment. In the same fashion, both faculty and students did have the same confidence of agreement with the A&D programs and the creative strategies in learning. In the following four questions, like faculty questions in the student survey, I needed to find out the students' experiences of the changes in the digital age and the traditional methods for their A&D programs during the fall 2020 or spring 2021 semesters. These students answered 42.11% yes and 57.89% no in this question if their faculty requires assigning instructional videos in their studio classes to augment in-class instruction. I wondered by asking what instructional videos were used and were helpful for them in their learning. These students shared their thoughts on the impact of their learning experiences:

- Ones [as videos] that showed the professor doing what he wanted from us. Such as an instructional painting with the techniques they wanted us to perform.
- Most were for learning to navigate the programs such as photo shop, adobe, etc. They proved beneficial.
- There were videos to review that were covered in Two- and Three-Dimensional Design, which were helpful because I have not taken that class. There was also a video tutorial on

how to use rubber cement that was helpful because I did not remember how to use it.

- Lecture demonstration videos. Lectures were helpful, demos were also helpful but better [-] quality cameras would have been better so we could see the details of technical demos.
- The instructor showed previous artwork to help us come up with our own pieces of art.
- We used instructional video for different methods of creating. I found it hard to apply it to the in-class because I am much more of a hands-on learner.
- Some extra videos watched during class to help provide a greater understanding to the technique that we were using.
- Demonstration of practices that were then demoed in class, such as sawing techniques.

Some students answered no (57.89%) that their faculty required assigning instructional videos in their studio classes to augment in-class instruction. From these students' responses, these technology-enhanced tools did benefit A&D programs more so than traditional hands-on procedures. Students answered 27.78% yes and 72.22% no in this question about any of their A&D courses if their faculty suggested online resources to augment in-class instruction that was not assigned. It was necessary to know what online resources were suggested and what were helpful to their learning. These students stated that:

- Sources like canva, they helped for sure.
- Online galleries/artist talks/art experiences/etc. Were suggested and all were interesting and helpful.
- There was an online textbook. I did not use it.
- Works by other artists as well as manual to detail other practices that were not covered in class.

Therefore, these several students who answered no (72.22% considered as high in percentage) that their faculty suggested online resources to augment in-class instruction that was not assigned. According to these few students' responses, technology-enhanced tools did benefit A&D programs more so than traditional hands-on procedures. However, it may be likely majority of the students who are more tech-savvy in today's time did use technology-enhanced tools on their A&D projects for ideas, problem-solving, instructions, to name a few. Additionally, there were few studies on effective teaching and learning techniques with technology-enhanced tools, and there is a greater need for more studies on A&D in the digital age era of advancing technology. In the last question on the survey, students responded with their 57.89% yes and 42.11% no overall if they feel there is a need to increase online digital skills for studio learning regarding traditional student learning in an A&D program. I also asked them why. These students shared programs. These four students wrote their responses to answer why:

- I think being able to bridge the gap between online and in-class is important especially for accessibility in the future.
- Give students that can only complete online courses more opportunities.
- I believe that digital fabrication of designs will help students think three- dimensionally with regards to their projects, helping them create what they want.
- Many companies in a broad range of industries look for online digital skills Lastly, the last student's written response had unconsciously answered my research

Question about the need to increase online technology-enhanced studio learning regarding traditional studio learning in an Art & Design Program. It was an obvious statement regarding today's higher education in the digital age. However, there were gaps involving digital skills and technology-enhanced tools with traditional methods. For instance, highlights a debate on the contribution of digital tools in art and design education compared with traditional hand tools. It was claimed having a technology device such as an iPad can make a difference by enhancing and supporting A&D learning [6]. Furthermore, there were limited studies comparing traditional hands-on tools versus technology-enhanced tools, such as an iPad. Another scholar, addressed that Higher Education has constantly been experiencing advancing digital technologies. Learners do have a greater need on the digital skills for future career jobs that do not exist today.

Differences between faculty and students data

These faculty and students agreed that they were satisfied in terms of the creative strategies knowledge in their courses in an online environment during Fall 2020 – Spring 2021 in A&D courses with 49.12% strongly agree, 57.89% agree, 77.20% somewhat agree, 0% somewhat disagree, 5.26% disagree, and 10.53% strongly disagree combined. According to the total of the percentage of the agreement from the construct of technology-enhanced studio learning in 244.45% and 55.56% disagreed from enrolled students (N=19) in A&D programs did gain more experience in art education with the combination of traditional methods and the digital age by using educational technology-enhanced tools. However, there may be a chance that the participants were guessing on some form of agreement on the survey, even with the positive large effect size from the Cohen's d = 1.61 as the standardized mean difference of students [14]. The Cohen's d was calculated from the independent samples t-tests between students: male & female. The Z-score = -1.20 was negative as below the mean. According to, the d = 1.61 can be regarding a 'large' effect size. With the large effect size, this result can be considered meaningful in that students have relationships within creative strategies knowledge in their A&D program online. Furthermore, scholars from research studies agreed that there is an enhancement of the overall effectiveness of student learning from technology-enhanced tools for digital skills in their creative activities, especially now in the 21st century [15].

Limitations and future assessments

Today's higher education has been changing along with advancing technologies and the desire for digital skills are greater in need and the pandemic proved the shortages of digital skills in any workforce. The focus on the factors for the quality of studio learning and teaching strategies could be to integrate technology with education to provide students a chance for online studio learning opportunities to upkeep the increasing demand for online education. With the increasing internet users, ade a good point by saying higher education's goals is "to eliminate educational limitations, to expand education, to save information, to contribute to the development of success and individual skills, to provide continuous education," and to make the online education available to reach a larger population of students to gain more digital skills.

Assessments for teaching and learning assessments

Assessments can be the solution for excellent quality in teaching students and studio learning. It is important to remember to create assessments before outlining the learning goals, objectives, and outcomes [16]. Another essential for assessment is that it is crucial to "close the loop" to determine where to improve studio learning by providing students feedback and examining data from the learners' grades [17].

Formative Assessment

Two formative assessment activities, The Muddiest Points and the One-Minute Response, need to be used and invested throughout the semesters. Before the end of each class session, instructors would hand out 5" x 8" index cards labeled "The Muddiest Points" and by having students write down what they are unclear on that day's topic [18,19]. After reading their muddiest points and revising in more straightforward explanations during the next class session, instructors need to have students complete a one- minute writing activity a few minutes before the class session. These one-minute responses will show students' feedback on what changes need to be made clearer.

Summative assessment

Rubrics are summative assessments and can enhance students' learning and critical thinking for their A&D assignments. Students can compare the criteria in a detailed performance level in a specific rubric with their critical thinking, writing, and feedback. Rubric acts as a guideline or a summary of the assignments, essays, or projects. A rubric can also help students improve their work with less dismay against the instructor on the grading system.

Classroom assessment techniques

The classroom assessment techniques are for A&D program instructors who do not have formal teaching and learning training in higher education. Instructors can engage these classroom assessment techniques with students in their self-assessment of ways of learning and group-work evaluations [18,19]. There are some self-assessments students could use for improvements such as peer feedback, self-assessment grading, and justification from a rubric for students to evaluate themselves and others of their critical thinking as accurate, relevant, and logical. Group-work evaluations can offer students to work together in smaller groups to discuss comments, specific critiques with strengths and weaknesses, and suggestions that may help students improve their work projects to earn better grading. Students are not the same kind of learners and can learn from each other while working together on assignments. Back to the student's comment about the A&D program assignments, "I had a Professor who seemed to think art only made sense or looked good if it was done his way with his ideas and gave poor grades to assignments that still met his gradebook criteria on the syllabus..." In the future, students can do self-assessment grading and justification on assignments for their instructors to know the students' reasoning with the grading. Instructors can compare the students' reasoning and the A&D program's syllabus grade book criteria.

Recommendations for Additional Future Research

The purpose of this research was to find out the quality of studio learning in the digital age during the pandemic from students' experiences in their A&D programs. The participants included their views on increased digital skills used in studio learning in A&D programs. Four responses for the open-ended student survey question to answer why pointed out the need to increase technology-enhanced tools for digital skills. The last question about digital skills on the student survey: Overall, do you feel there is a need to increase the students' digital skills used in studio learning in the A&D Program? Why? I believe that these four responses from these students clearly stated why there was a greater need for assessment in teaching and learning of Arts and Design program with technology-enhanced tools and digital platforms to upkeep in this digital age:

- I think being able to bridge the gap between online and in-class is important especially for accessibility in the future.
- Give students that can only complete online courses more opportunities.
- I believe that digital fabrication of designs will help students think three- dimensionally with regards to their projects, helping them create what they want.
- Many companies in a broad range of industries look for online digital skills.

Lastly, this student unconsciously answered my research question about increasing online technology-enhanced studio learning regarding traditional studio learning in an Art & Design Program? This student entered the response, "Many companies in a broad

range of industries look for online digital skills." There are gaps involving digital skills and technology-enhanced tools with traditional methods. For instance, highlights a debate on the contribution of digital tools in art and design education compared with traditional hand tools. It was claimed having a technology device such as an iPad can enhance and support art and design learning. However, limited studies compared traditional versus technology- enhanced, such as an iPad. Another scholar, addresses that Higher Education has constantly been experiencing advancing digital technologies. Learners need digital skills for future career jobs that do not exist today.

Conclusion

In conclusion, the A&D programs were the statistical argument about the students' experiences with traditional and technology-enhanced methods. The support from the statistical argument for the statistical significance in students' traditional studio learning with traditional hands-on tools in the A&D programs did satisfy these students during the pandemic in education. Furthermore, based on the data from students' survey with low satisfaction on the online studio learning opportunities and more agreement on the need for digital skills in studio learning, higher education in the 21st century will continue to strive for improvement and address the need for more quality distance learning research and quality arts learning and teaching experience [20-22].

Funding

This project received no external funding.

Institutional Review Board Statement

The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the Institutional Review Board of the University of North Dakota, Division of Research & Economic Development Office of Research Compliance & Ethics (protocol code: IRB0003465; approval date: 07/09/2021) for studies involving humans.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data that support the findings of this study are available in the supporting information provided alongside this article.

Conflicts of Interest

The author declares no conflict of interest.

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