

# **Industrial Design Student Perspectives on Blended Learning and Learning Styles: Best Practices to Prepare Students for Success**

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## **Abstract:**

The use of digital learning tools within higher education is steadily increasing to include offering courses entirely online which were previously taught in the traditional classroom setting. This movement towards integrating technology into the class structure provides new ways for students to engage with course material. As a trade-off, students have fewer opportunities, overall, for face-to-face learning which is an integral component of the traditional classroom learning environment. The purpose of this research is to investigate the advantages and disadvantages of using digital learning tools versus traditional learning methods, while examining students' individual learning styles and the role they might play in the efficacy of learning and retention. Research is conducted through group interviews with students engaged in learning in either a traditional classroom setting, an online classroom, or a hybrid of the two. Through a focus group study, information is gathered, discussed, and critically analyzed and then organized into themes in order to aid in the future development of best practices for teaching and learning involving digital and online media. Based upon this study's findings, future research is planned to further investigate, suggest, and develop best practices to include strategies specific to blended learning in which traditional learning methods are more seamlessly fused with digital learning tools.

## **Keywords:**

Online class, traditional classroom, hybrid course, blended learning, scholarship of teaching and learning, learning styles.

## 1. Introduction - Background

Instructors may benefit their students' learning by offering a wider variety of course content delivery methods to account for students' individual learning styles. This can be accomplished by using audiovisual materials, hands-on learning activities and varying between lectures, in-class discussions, reading assignments, and different assessment methods (written exams, essays, and verbal presentations) (Davis, 2009). The concept of blended learning is a good example of appealing to students' varied methods of preferred learning and interaction with course material. A common definition of blended learning is "the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (Garrison & Vaughan, 2008, p. 148). The integration of online/digital activities with traditional face-to-face classroom activities must be done in such a way that the result is greater in depth, engagement, and retention of the course material than either of the delivery methods alone (Garrison & Anderson, 2003).

Blended learning allows students the flexibility to engage with course material through a variety of learning styles. This benefit further helps students develop independent learning skills which are critical to becoming a lifelong learner. "Blended learning incorporates online tools into students' toolkits, which in the past have consisted of notebooks, paper assignments, and 'stand and deliver' classroom presentations. This expanded toolkit helps students better develop their higher education and workforce skills. Blended learning extends teaching and learning beyond the classroom walls, developing critical thinking, problem solving, communication, collaboration, and global awareness" (Pape, 2010, p. 23).

A previously conducted study examining the satisfaction of students with blended learning, indicates a vast majority of students had a positive experience (see figure 1). This previous study included students that were representative of a broad range of majors (Picciano, 2014). Because the investigators are either a professor or student in the discipline of industrial design, this new study specifically examined perspectives of students studying industrial design. The study of industrial design differs somewhat from more traditional academic majors. Students are often attracted to industrial design because of the hands-on nature of the curriculum. Students solve design problems through activities such as hand-drawing, CAD modeling, working with various materials such as wood, metals, and plastics in a shop setting, and receiving feedback from classmates and professors in the form of open critique sessions to aid in improving design solutions. Since only industrial design students were included in this study, the results may or may not be relevant to all other majors.

	<i>Percent</i>
Very dissatisfied	7
Somewhat dissatisfied	9
Neither dissatisfied nor satisfied	25
Somewhat satisfied	31
Very satisfied	29

Figure 1. Student satisfaction with blended course (n=1,315). (Picciano, 2014, p. 43)

## 1.1 Objectives and Learning Outcomes

This study has multiple aims:

- To determine the efficacy of blended learning in comparison to traditional teaching methods and technology-driven teaching methods.
- To explore the impact on overall learning that varying learning styles have when combined with blended teaching and learning.
- To collect and analyze student feedback concerning engagement with course material across various types of teaching styles.
- To begin to research and suggest best practices for delivering course material to maximize learning for a diversity of learning styles. This will be accomplished through the investigators' reflection on the information gathered through the study.

Learning outcomes:

- To understand how the variety of learning styles can affect students' retention and learning in different learning environments.
- How instructors can develop and utilize blended learning course materials with multiple delivery methods to align with students' individual learning styles.
- Looking at teaching as a collaborative effort involving instructors and students. Instructors view themselves as facilitators helping students understand their individual learning styles and capitalize on methods that allow them to take charge of their own learning, so they can become life-long learners, positioning them for success in the professional world.

### 1.1.1 Methods and Research Philosophy

All focus group participants were current students of the Metropolitan State University of Denver (MSU Denver) Industrial Design program who were enrolled or have completed online courses, traditional in-class courses, and/or blended (hybrid) courses. The focus group was comprised of a total of ten male and female students, representing a heterogeneous mix of visual, auditory, and kinesthetic learning styles. Predetermined

open-ended questions were asked of the group as a whole, allowing students to express their opinions without pressure from their investigators. Questions included the following:

- What aspects of your on-line course did/do you appreciate (e.g. flexibility, working on your own schedule, access to online documents, ability to review content as many times as you like, etc.)?
- What aspects of your on-line course did you find challenging (e.g. no interaction with the instructor or other students face-to-face, difficulty managing time, forgetting about the class, hard to keep up with schedule, awareness of due dates, communication issues, etc.)?
- How would you describe your most dominant learning style? In other words, how do you best learn?
  - Visually (PowerPoint presentations, demonstrations, field trips)
  - Aurally (lectures, discussions)
  - Tactile (hand-on projects)
  - Kinesthetically (exercises that involve moving around, working with something physical)
- How do you think your individual learning style (e.g. visual, aural, tactile, and kinesthetic, etc.) affected your success in your on-line class? Your in-person traditional class?
- How would you describe communication between students/instructor in your online course vs your traditional in-class course (for assignment/assessment feedback, discussion, group activities, etc.)? How can it be improved?
- How could a blended course contribute to your success in your future career over a traditional in-class or online course?
- When thinking about how course materials are presented to you in either online or in-class courses, what have you found to be the most effective means of course content delivery? How can this be improved (e.g. it is helpful to have PowerPoint slides online to support in class notes)?
- Name some digital tools have been used in classes you have taken or are currently taking.
- In your experience, in what ways were the tools effective or ineffective in enhancing or enabling your learning of the course material?

IRB approval was obtained prior to conducting the focus group. The interviews lasted for 1.5 hours, during which time several lively discussions ensued as the students' responses often prompted additional commentary from others in the group. Some members of the group were more vocal than others, but even those participants who appeared more introverted gave thoughtful answers and input into the group discussion. The student responses were recorded by the three investigators and compared at a later time to discover themes within the results. Prior to the focus group study, the investigators expected three themes to arise out of the students' responses:

1. Learning styles play a role in preference of course content delivery methods.
2. Blended courses are shown to be more successful in appealing to a spectrum of learning styles.
3. Educators should develop best practices for implementing blended teaching and learning with input from their students.

### 1.1.2 Learning Styles

1.1.2

During the focus group study, the investigators provided definitions for the three classifications of learning styles - visual, auditory, and kinesthetic - and then asked the students which learning style they most identified with. The definition given of the three different learning styles is as follows:

#### Characteristics of Learners by Style:

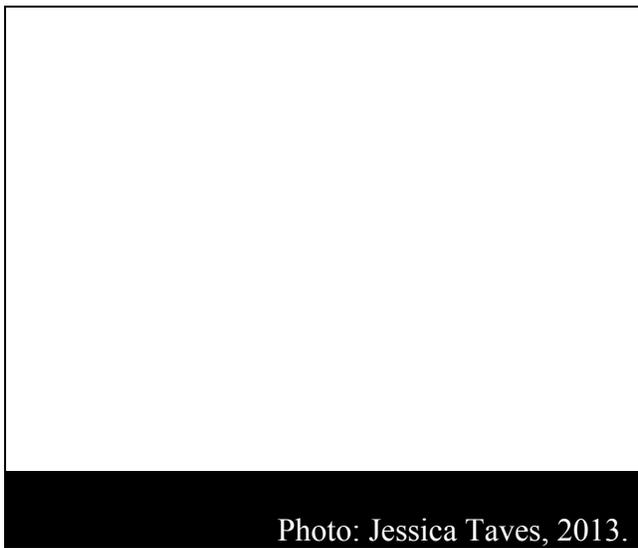


Photo: Jessica Taves, 2013.

***Visual:***

- Uses visual objects such as graphs, charts, pictures, and seeing information.
- Good perception of aesthetics.
- Reads body language well.
- Tends to remember content that is written down.
- Learns better in lectures by watching them.

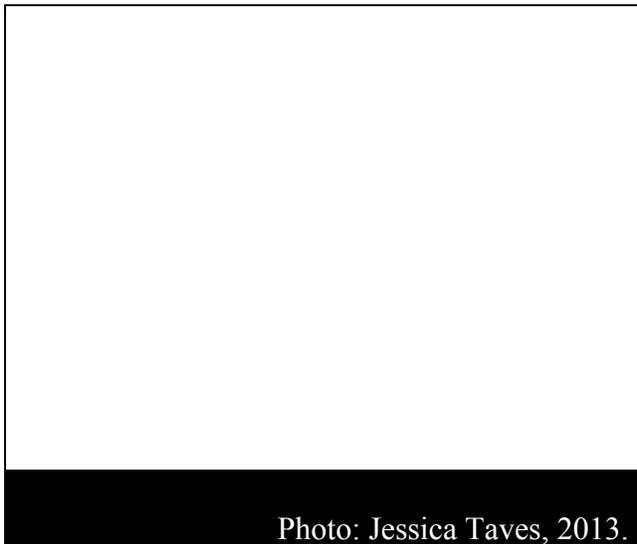


Photo: Jessica Taves, 2013.

***Auditory:***

- Retains information through hearing and speaking.
- Prefers to be told how to do things out loud.
- Notices different aspects of speaking.
- Often has talents in music and may concentrate better with soft music playing the background.



Photo: Ian Mueller, 2015.

***Kinesthetic:***

- Prefers the hands-on method to learn new material.
- Is generally good in math and science.
- Would rather demonstrate than verbally explain how to do something.
- Usually prefers group work more than others (3 Learning Styles, 2015). (Photo: Ian Mueller 2015)

**2. Results**

Of the students participating in the focus group study, 10% identified themselves as an auditory learner, while interestingly, the remaining 90% of the students identified themselves as a mix of both visual and kinesthetic preferred learning styles. This variance from the results of comparable studies could possibly be explained by the fact that all

students who participated in the study were current students in the Industrial Design program which, by the nature of the industry, predominantly caters to both the visual and kinesthetic learning styles.

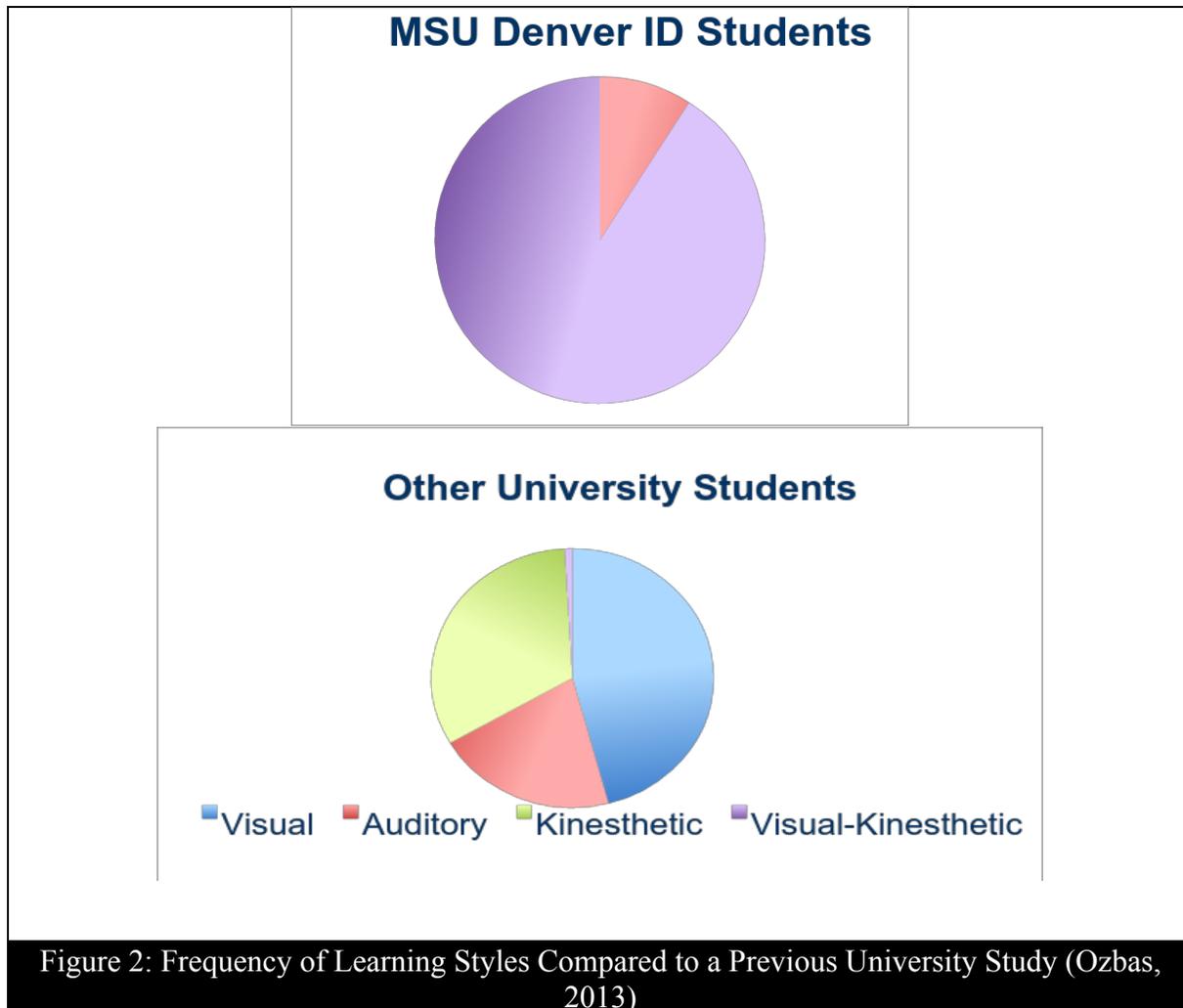


Figure 2: Frequency of Learning Styles Compared to a Previous University Study (Ozbas, 2013)

## 2.2 Online Courses

Since 90% of the students sampled had previously completed an online course, there were many lengthy discussions regarding experiences with online courses. Overall, students commented that they believed online courses primarily appealed to only one of the three learning styles, the visual learning style. This was because of the heavy emphasis on visuals that they experienced in online courses. These visuals included reading online handouts, visiting suggested webpage resources, and watching online videos. Online classes can also appeal to an auditory learning style through listening to recorded lectures or watching videos if they are integrated into the course content, but this was noted as less common by the students. Kinesthetic learning styles were not readily addressed through online courses.

<b><i>Pros:</i></b>	<b><i>Cons:</i></b>
Flexibility of assignment due dates (self-paced)	Lends to procrastination (hard to stay on track)
Communicate with geographically distant classmates	Long wait period to get email response from instructor
Instantly graded quizzes and tests	Online interface (features/tools) is confusing
Automatically calculated cumulative grade	Instructor unfamiliar with online platform
Easy "A"	Less personalized feedback from instructor
Having assignments on a schedule	Less accountable
Ability to edit your thoughts (writing assignments)	No interaction with other students
Accessibility of content anytime	IT difficulties (systems could have issues)

**Table 1. Student Feedback Regarding Experiences Taking Online Courses**

The students emphasized that the biggest advantage offered by online classes was the flexibility to complete the coursework at the student's pace. Students appreciated how they could work on assignments around their already busy schedule. Students could turn in assignments any time during the day and night rather than having to be present in class and turn in assignments physically during a specified class period. Students could even work late into the night and turn in an assignment at midnight or 2 am. Other benefits that students identified included automatic grading of assignments and the ability to see a cumulative grade, so they readily knew their standing in class (only if the instructor had set up this feature and continually input student grades). The ability to work on assignments remotely also created the opportunity to communicate with a variety of students that the online student had never personally met. This included connecting with students living in other states and potentially students living/working in other countries.

Even with all of these noted benefits, the general consensus among students was that they learned less in online classes and preferred in-person traditional classes much more. The self-paced context of an online course, while offering the student flexibility in completing assignments, conversely, also introduced the potential for procrastination and caused students difficulty to complete tasks on time. It has been noted in a previous study that students who excel in online courses tend to be more independent learners who do not require as much structure and guidance as a traditional classroom provides (Diaz & Carnal 1999). This correlation appeared to be reflected in the students' responses, in that, students felt less accountable in an online class because they were not personally interacting with other students and the instructor who tended to help keep them on track.

The interface used in online classes was found to be confusing for some students. There are often many online features and tools available to students in a typical online course (e.g., discussion board, chat, email, content, videos, calendar, electronic readings and handouts, etc.). Some of these tools, students found to be challenging to understand and use while some features might not work at all or the instructor chose not to activate the feature. Students also expressed frustration with the learning curve necessary to effectively navigate the online platform. A general familiarity with computers and navigating the Web seems to be absolutely necessary for success in an online course. Instructors were also occasionally noted by the students as being unfamiliar with the online platform and having to apologize for difficulties in effectively navigating the online instructional software to best present the course content.

### 2.3 Traditional Courses

All of the students researched were familiar with traditional course offerings, having matriculated through typical public and private education institutions in the United States. In traditional teaching situations, a teacher is present and able to interact individually with students on a person-to-person basis. Such a teaching approach allows the student to ask immediate and direct questions and receive instant response to their queries. In traditional teaching approaches, teachers are also able to deliver material at a pace that is tailored to the immediate needs of students, altering the delivery of course content in a manner that suits the perceived needs of the students in the classroom. The students in the focus group study mentioned several benefits to traditional teaching, but also discussed several problems with such delivery methods.

<b><i>Pros:</i></b>	<b><i>Cons:</i></b>
Physical presence of instructor and other students	Requires attendance on institution's terms
Students can get immediate responses to questions	Instructor is only available in class or office
Instructional pace tailored to needs of class	Inability to view instruction outside of class
Students engage through energy of teacher/students	Difficulty connecting outside of class
Face-to-face communication is more effective	Face-to-face communication is limited to class
Multiple learning styles served better in class	Some learning styles still excel outside of class
In-person critiques contain more in-depth feedback	Critiques may lack anonymity and candor
Critical thinking exercises enhanced by instructor	Some students may not contribute in class

**Table 2. Student Feedback Regarding Experience in Traditional Courses**

These study participants discussed how they appreciate the ability to speak with a teacher one-on-one in the event that there are concerns or questions about the class. Being able to converse with an instructor in their office during office hours was viewed as very desirable and helpful when challenges arose during a course. One student had such strong feelings in this regard that she said it “should be illegal to not have an office to meet in [when I have questions]” if learning under an instructor for any university course, online or traditional. Communication was deemed more valuable to the students when it was directed in a personal way rather than as a bulk email message to the whole class - as would be common within an online course. Participants viewed personalized communication as much more meaningful than the one-size-fits-all communication of online offerings. Additionally, in-person communication engenders an immediate response, which contrasts with the nature of email communications which can often go unanswered for days at a time. When time sensitive questions arise, in-person communication was viewed to be considerably more effective and beneficial to the students’ success in the course, as noted by a majority of the students interviewed.

Study participants voiced their appreciation that all three learning styles were commonly addressed through traditional classroom interactions. Students seemed to feel that they could gain more from in-class learning due to the variation in content delivery that traditional teaching promotes. With in-class interactions, instructors are able to determine the immediate needs of students and are then able to create ad-hoc adjustments to their teaching style to fit the needs of their students accordingly. Since response time is greater in online delivery methods, students agreed that in-person teaching was more effective and engaging.

Students felt that learning was enhanced when they could “feed off” the teacher’s enthusiasm for the course material, and were able to likewise find better engagement with their fellow students’ energy in the class, too. This ability to feel more engaged in the classroom led to several students additionally responding that they tended to learn more from in-person presentations than from pre-recorded presentations, podcasts, or videos. In fact, multiple students mentioned that they have sought out additional classes from certain professors due to their unique, in-person presentation style and personality - something that is very difficult to determine through online learning. Students also discussed the fact that they tend to have more opportunities to think critically when a teacher is present due to the interpersonal synergy that exists in classroom interactions where the instructor can deliberately guide the flow of a discussion. This in-class interaction was also viewed as beneficial when it came to critiquing student work, especially when the entire class was participating. Online critiques were viewed as overly “cold”, impersonal, anonymous and lacking accountability - often leading to a “slippery slope” of negative interactions. Conversely, in-person critiques tended to include better interpretations of a person’s tone of voice and body language, constructive feedback, and generally more amiable interpersonal communications. Students also discussed how they tended to gain more inspiration by viewing the work of other students around them in the classroom, noting that it was difficult to work creatively in isolation, as is more common with online courses.

There were a number of areas in which traditional teaching fared poorly in comparison to online teaching. Study participants discussed that they often desired that instructors in traditional courses would make course materials available online for instant access so students could refer to them as needed. This included not only syllabi and assignment information, but also PowerPoint presentations, audio/video recordings of presentations (including the additional “side-note” tangent commentaries that are often provided by instructors in a traditional classroom setting), videos of demonstrations, the ability to see current grades and assignment results, and better file access for the class to include sharing files between students. Students viewed these corresponding aspects of online courses to be superior over traditional classroom tools to the extent that they would significantly improve traditional learning if they were successfully implemented into classroom instruction. These various responses alluded to the need to incorporate online technologies into traditional courses, creating in essence, blended (or “hybrid”) learning situations wherein benefits from both delivery methods would be realized.

### 3.0 Blended Learning

Responses from the students engaged in this study suggest that a combination of both traditional course delivery methods and online methods would ultimately produce an optimum learning environment appealing to the broadest spectrum of learning styles and best facilitating student learning. This finding is consistent with findings of other researchers on this topic (Picciano, 2014). While interviewing the students in the focus group, the investigators probed for ideas in implementing blended teaching methods. Many of the students in this study proposed interesting solutions to this content delivery dilemma that the researchers found noteworthy and insightful. Students in this study observed that first-day-of-class interactions are instrumental in allowing the students to get to know their fellow classmates and instructor, and to set the groundwork for good interpersonal communication throughout the course. Students also mentioned that the flexibility of online courses was very desirable, as long as in-class accountability was maintained to assist them in completing coursework in a timely manner. As a result, several students suggested that it would be advantageous to have a course that would require students to meet once a week, but then interact through online means at other times of the week. In this manner, students would be given more freedom to complete work at their own pace while still benefiting from face-to-face interactions and teacher/student communication. Students also discussed the importance of having the ability to submit deliverables ahead of time, but that midnight deadlines through online submission are also helpful as they juggle busy schedules and extracurricular responsibilities.

Group work was one area in which blended learning methods appeared to assist students in their learning efforts. Students mentioned that it can be difficult to write in groups - even within a traditional learning environment - but that online collaboration was especially difficult. To remedy this difficulty, students suggested that group work should have a combination of online and physical interaction. Group work should be limited to only two students (larger groups complicate communication efforts), individuals should be required to meet periodically in-person as a group and with the instructor to gain needed feedback,

and an effective file sharing infrastructure should be employed at the beginning of the course to avoid difficulties during the semester. The use of online video chat resources can be helpful to avoid misunderstanding, as well, but should not be the only means of interpersonal interaction.

Additional digital tools can complement traditional teaching to produce a superior blended teaching environment. One of these includes the ability to chat as a class remotely to gain quick responses to questions from the instructor or other classmates. Critiques can be conducted in-class, but then also allow interactions through websites such as Pinterest or blogs to make anonymous, impromptu responses possible.

Screens integrated into students' desks would make it possible to provide enhanced course content - even interactively - to augment the quality of presentation materials in a traditional course. This use of screen technology was viewed as intrusive if the screens themselves obstruct the view of the instructor or other students, so screens should be as nonintrusive as possible. Screen sharing methods were viewed as beneficial in allowing an instructor to view information on a student's screen and to grant them control over the student's computer as needed to assist with demonstrations or step-by-step instruction. Screen sharing would also provide a means of instructor intervention if a student is not mindfully attending to a classroom task, venturing into distracting media, or is significantly lagging behind in class instruction. Screen technology can also make it easier for students to follow an instructor's in-class directions, especially when computer-intensive instruction is the norm for a course. A screen that is integrated into the student's desk or workstation would help students to maintain visual acuity of the current instruction while more speedily following along on their own computer screen. Document cameras or other digital camera technologies can be helpful in presenting physical models to a class in real time, allowing students to see an actual object of study while being able to interactively discuss the object as a class.

Students also discussed how near-term 3D technologies are promising to enhance the classroom experience, especially in creative disciplines. Three-dimensional computer models of objects used in an in-class teaching situation can bring an additional level of learning opportunity to explore artifacts or environments that may be otherwise time or cost prohibitive to investigate in the classroom. These may provide students with the opportunity to engage in instructor-guided learning of physical items while still allowing them the freedom to explore at their own pace outside of the classroom. As a complement to 3D computer models, holographic and augmented reality hardware could make such objects more interactively viewable, allowing a deeper level of stereoscopic investigation for students to learn from. Recent advances in 3D printing technologies are raising hopes that rapid (or instant) 3D printing could soon become available in the classroom or through online instruction to give students the ability to handle tangible objects that could assist them in a variety of learning situations. These particular technologies would be of significant benefit to those kinesthetic learners who may otherwise feel misplaced through online course delivery methods.

## 4.0 Conclusions

To better meet students' needs, instructors should recognize that multiple learning styles need to be adequately recognized and addressed. Not all learners will benefit from a one-size-fits-all delivery of course content. Therefore, changes to both traditional teaching and online courses must be made to better match students' learning styles and more effectively support their education efforts.

It should be noted that there were certain limitations inherent in this study. One of these included the fact that the students each self-assessed their learning styles rather than having a formal learning style assessment. Additionally, studies beyond the industrial design discipline were not performed to determine broader applicability of these study results. As a result, further research should be done before drawing widespread inferences about the effects of blended learning on learning styles in higher education coursework.

Regardless, based on the responses from students in this study, and in agreement with prior research on this topic, it appears that blended learning methods may ultimately prove to serve the widest variety of learning styles, and do so more effectively than is possible through traditional learning or online learning alone (Picciano, 2014). This is especially true of students who learn through kinesthetic means, as noted through this research. Students generally feel that certain online tools can be integrated into the traditional classroom to help them gain the freedom needed to collaborate and learn over long distances, at their own pace, and on their own schedules. Nevertheless, they also feel that interpersonal communications are an integral component to effective communication and learning, so supplanting these with the limitations of online-only interactions can be detrimental to their educational experience. A hybridization of these teaching styles can better suit the needs of students with varied learning styles by giving them multiple means of learning, as provided through a variety of enabling technologies available to educators today.

In accordance with these findings, it appears that blended courses would be the optimal delivery method for course content, especially when conscientiously developed to meet the specific needs of all learning styles. In fact, it may be concluded that properly designed blended courses should be the norm, given the current technological capabilities of most institutions. Digital tools integrated into the classroom can benefit students by providing for schedule flexibility, allowing immediate and ready access to course content, and providing the in-person contact that is critical for appealing to the broadest spectrum of learning styles.

As a result of this research, it is apparent that additional research should be planned to further develop best practices for integrating technology into a variety of learning environments to best appeal to students' individual learning styles. A survey should be conducted of all the available digital tools that can be integrated into the classroom. The available technology should then be assessed according to how best it can benefit students' education and then experimented with in different learning environments. With this

information, detailed best practices can be developed to help instructors maximize their students' individual learning.

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