International Journal *of* Designs for Learning
2023 | Volume 14, Issue 1 | Pages 119-129

EMOTIONAL DESIGN IN AN INTRODUCTORY COURSE: AN INITIAL EXPLORATION

K. E. Rajcic, *University of Minnesota*

This design case is about Emotional Design Theory in application to the design of pandemic face masks. As we know designers rely strongly on theoretical knowledge in making design moves. To understand how students may learn to apply theory, research was conducted to test the effectiveness of an assessment called Design CUE (Conceptual Understanding Evaluation).

In this case, I describe the research study context and rationale for the development of the Design CUE as an instructional assessment used to teach emotional design to undergraduate students at a large midwestern research university. Emotional design is a threshold concept in design education developed by Norman; it identifies three levels of focus: visceral, behavioral, and reflective. This framework was presented in class and learner performance was evaluated through the completion of the Design CUE, the purpose of which was to transfer learning by bridging concepts learned in class to a design task.

I report how the design succeeded in teaching emotional design theory but failed to initiate greater student creativity in applying theory, most notably in the visceral level of emotional design. I document the undergraduate course in which the design was used. I also provide the context of the research study which sought to understand if students could apply the theory of emotional design and how they incorporated emotional design into the design of pandemic facemasks.

K.E. Rajcic is an instructor at the University of Minnesota. Her research interests include aesthetics, creativity, design education, design theory, and material culture.

https://doi.org/10.14434/ijdl.v14i1.35350

THE CONTEXT

Theory of Emotional Design

I conducted research in a course titled "Introduction to Design Thinking." The course is a lecture format with multiple discussion sections led by graduate teaching assistants. The course is required for students in apparel design, graphic design, interior design, product design, and retail merchandising. It is generally taken in their first year at the University. The course is also a popular elective for students majoring in other fields. Students majoring in Graphic Design represented the largest number of students in the course and as study participants followed by retail and apparel design majors.

A wide range of readings support the course lectures. One central concept presented in the course was based on Norman's theory of Emotional Design (2004). Until this study, the only evaluation of student learning of the concept of emotional design had been in the form of an exam question regarding a case study of design failure.

Emotion is fundamental to all human behavior and Norman (2004) urges it to be infused into every aspect of the design process. Therefore, in educational terms, emotional design can be considered an essential threshold concept to be introduced in beginning design coursework.

A "threshold concept" is a concept that once understood, changes the way that a person thinks about a topic. A threshold concept can be considered akin to a portal, opening a new and previously inaccessible way of thinking about something (Meyer & Land, 2003).

Investigating "How" undergraduate students effectively learn about emotional design has been a neglected area of scholarly research. In design thinking-based curricula, student understanding of emotional design is necessary but assessing these skills is usually a challenging task for design educators and researchers. Little research had been conducted to evaluate the design thinking skills of students gained in such courses (Aflatoony, Wakkary, & Neustaedter, 2018). Sharing this view, Yu and Nagai state "Teaching emotional

design to design students in general has been overlooked due to its difficulty" (2020, p.1).

In teaching the course, I actively sought out ways to enhance student learning. One way I did this was by reading student survey comments from the previous semester. A student comment suggesting using a "current design issue" for a class assignment specifically stating "pandemic face masks" as a redesign project led me to the notion that face masks may be an effective way to teach emotional design theory as the mask mandate had been eliciting so many emotions from the public in general.

Situated Learning

We know design education can be greatly enhanced by introducing students to developmentally appropriate conceptualization tools as a teaching strategy. To grow as scholars, students must be able to match theory to real-world situations on their own (Ricke, 2018). To many students, the "theoretical" is a space in their thinking that does not come automatically in practice. Many consider design theory to be the antithesis of "actual" design (Taura & Nagei, 2012). However, studying and applying conceptual frameworks and process models as well as design theory, most often produces more thoughtful students and in doing so more impactful designs (Roudbari, 2021).

These educational viewpoints further influenced me to design a conceptual understanding exercise to teach theory. My decision to use pandemic face masks as the designed artifact to teach emotional design theory was influenced by several factors including face masks encompass diverse design disciplines including apparel, textile, product, human factors, and surface design as well as being public health safety devices. The experience of wearing a face mask was widespread and masks have been in use by students for several months prior to the course. As a designed artifact they are simple to understand, and students do not need complicated skills to enter the arena of the product designer.

Because every student at the time, was already an experienced user, using face masks as the subject of a design exercise provided an opportunity for situated learning Young explains that

Norman believes designers need to know more about the sciences including the social sciences (2018). Introducing students to emotional design during a social crisis makes the pandemic face mask uniquely qualified to serve as a vehicle for teaching and understanding emotional design.

For over a year, face masks had been part of the study of participants' daily lives and consequently their emotions. Emotions occupy all aspects of daily life including moods, cognition, behavior, attention perception, and memory (Russel, 2003).

Consequently, they influence and affect aspects of everyday activities and interactions between people, the environment, and the products and services that surround them (Bucolo & Wrigley, 2012). In completing both the survey and recalling their own experiences with pandemic face masks participants tapped into their "Design Memory" (Oxman, 1994), an intellectual or abstract record of previous experience which may beyond the surface touch the deeper emotions of the user.

Norman (2004) contends that emotion is fundamental to all human behavior and urges it to be infused into every aspect of the design process. Presented with the opportunity for situated learning during the Covid-19 pandemic, I conducted a study on which this design case is based titled, "Learning Emotional Design by Application to Pandemic Facemasks."

The Study Based on Experiential Learning Theory

The design of the semester-long research study for which the instructional design featured in this design case was to be tested was based on Experiential Learning Theory (ELT) (Kolb, 1984). Kolb's experiential learning style theory is a four-phase learning cycle: Concrete experience (apprehension), abstract conceptualization (comprehension), reflective observation (intention), and Active Experimentation (extension). Real experiences help individuals learn and understand abstract concepts such as Emotional Design Theory, and critical thinking leads to refining ideas or thinking about alternative possibilities.

The study used a mixed methods approach with multiple data sources. The study was conducted asynchronously online. As part of the study, students took part in a 31-question pandemic face mask experience survey, The survey entitled Norman Exercise 1 (see Figure 1, next page) was administered via a secure portal on Survey Planet to 128 students enrolled in an Introduction to Design Thinking course in spring semester 2021. The range of survey questions provided inquiry into the students' initial reactions to face masks, their experiences wearing them, and the meanings they associate with face masks.

The survey was created both to assess students' experiences with pandemic face masks and serve as a creative stimulus for solving design problems associated with their personal mask experiences.

The survey consisted of a Likert scale questionnaire with 3 additional fill-in answer questions for a total of 31 questions. Survey Planet independently tabulated the survey results and reported them via their website. Student participants were required to complete the survey to receive 5 class points. The survey completion results generated by Survey Planet were used by 6 teaching assistants to record participation scores.

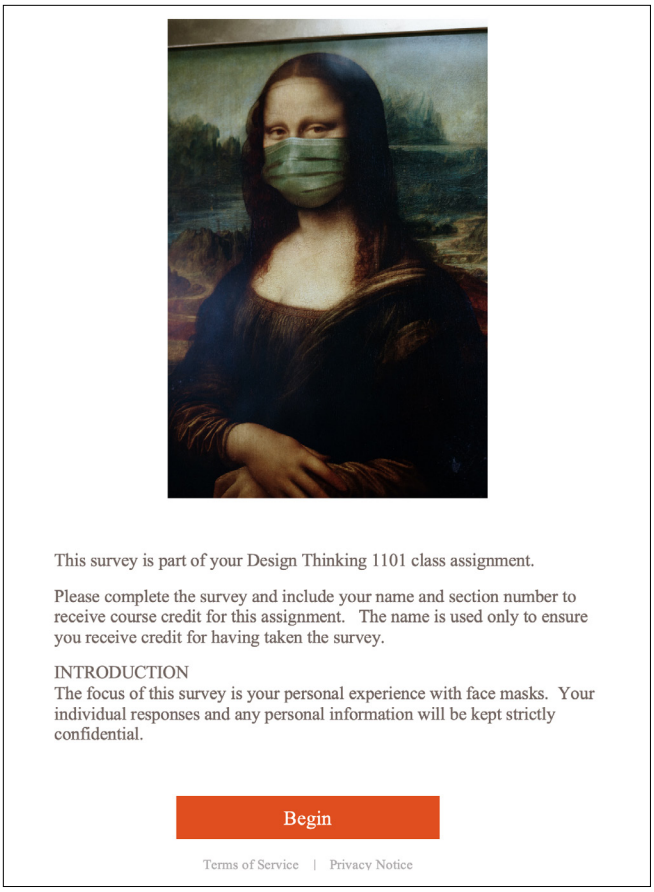


FIGURE 1. Image from the survey "Norman Exercise 1" as displayed on SurveyPlanet.com. (Image of Mona Lisa with Face Mask courtesy of Pixels com).

During the six weeks following the survey, students were introduced to Norman's 3 Levels of Emotional Design in three separate assignments. The first of which was to read Chapter 3 of "Emotional Design: Why we love or hate everyday things" (Norman, 2004). The reading featured a case study detailing design failure in the context of emotional design through examples of professional sports league headphones. Students then were assigned a TED® Talk titled "3 ways good design makes you happy" (Norman, 2003).

This was followed by a class lecture covering Norman's 3 Levels of Emotional Design with slides from the lecture provided to students online for use when completing the Design CUE (see Figure 2).

The Design CUE was a new addition to the course syllabus, a change made by the lead instructor. The exercise was administered asynchronously and online. Students were given one week to complete it. No extensions were given.

THE INSTRUCTIONAL DESIGN

Conceptual Framework

The Design CUE (see Figure 2) was based on the ELT premise that a person learns from direct experience—in this case using and designing face masks during a pandemic.

Prior to the study, students in the Design Thinking course used design process models to complete team creative projects. I saw first-hand that such models provided a structure that was extremely useful for student evaluation.

In creating the Design CUE, I was motivated by what the authors of The Movement to Build More Effective Assignments, believe; "Focusing on more effective, intentionally designed assignments can reinforce program outcomes, contribute to meaningful assessment and most important support student success" (Hutchings et al., 2018, p.1). I embraced the idea that "the design of learning exercises is one of the most creative and consequential tasks that faculty undertake in their work as teachers" (Hutchings et al., 2016).

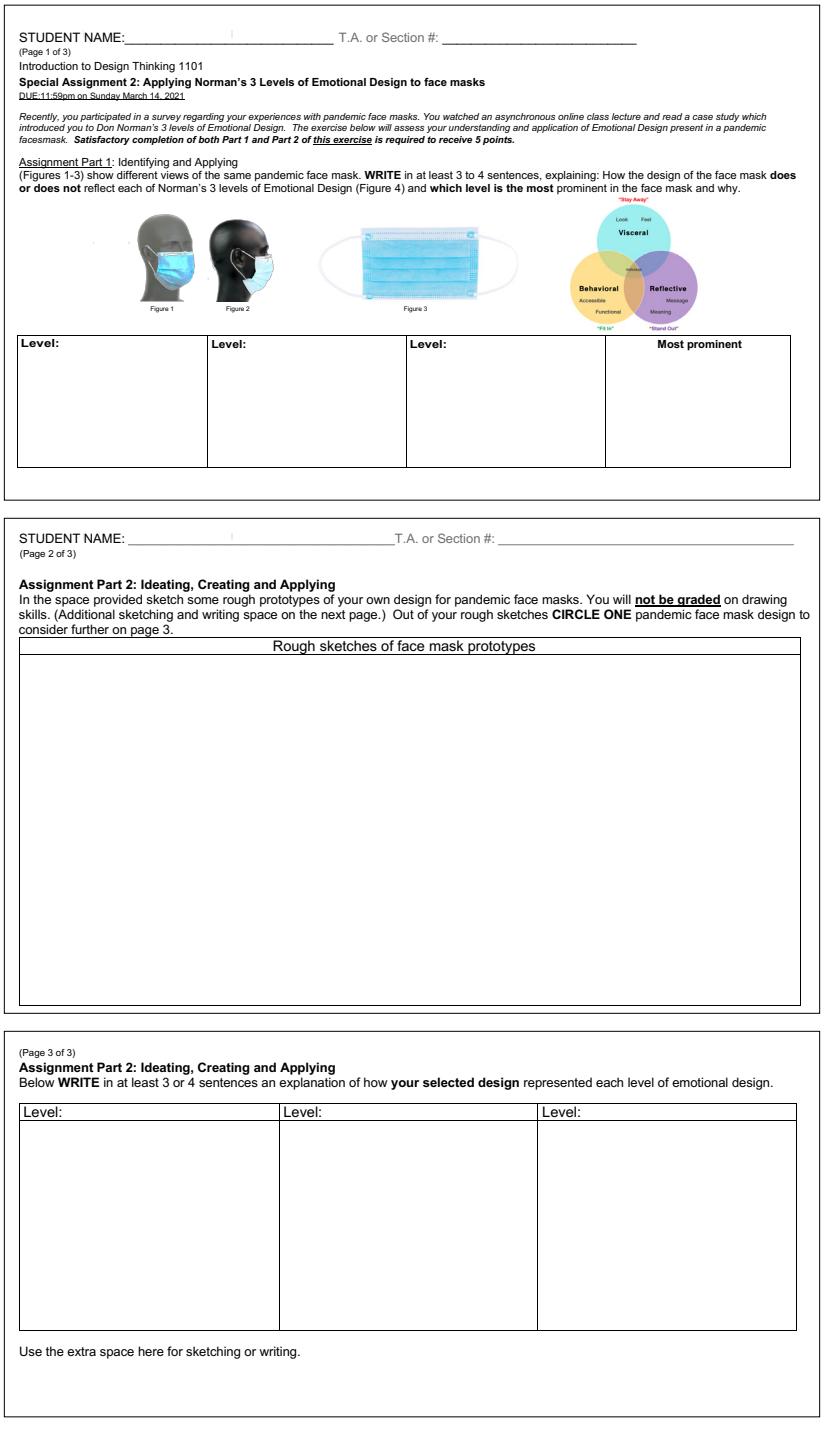
As designers, we understand design is a field that asks for a different outcome than one previously created, however, in user-centered design it is necessary to be able to transfer case information. In completing the Design CUE exercise transferring information required that something was known about a situation (i.e., the Covid-19 pandemic and facemasks), and that knowledge was then applied to a new situation, that of creating masks based on a newly learned conceptual framework.

Teaching students a subject and then later having them put that knowledge into a new context or having them use what they learned on another project is a way of fostering transfer learning through bridging (Perkins & Salomon, 1992, p.10). In completing the Design CUE, bridging occurred when students applied Norman's 3 levels of Emotional Design in part one of the exercise to an existing face mask design, followed by applying the 3 levels to their own face mask design.

The Design CUE was structured to help students organize the 3 levels of emotional design as three distinct levels present in one artifact, the face mask. The idea is that students will be able to perceive design situations and issues better if they understand a theory, framework, or principles that require their critical thinking abilities. "For students to get better at transfer, we must help them organize knowledge. This means helping students build conceptual frameworks in their brains" (Shank, 2004, p. 1). The extent and degree to which each level was present in the existing face mask as well as their own design were determined solely by the students requiring them to think beyond the mere presence of the levels. Results of the study, (see Table 1) indicated 82% of students reported that the behavioral level of emotional design was most prominent in the blue face mask.

MOST PROMINENT LEVEL	STUDENTS	% OF TOTAL
Visceral	8	6%
Behavioral	102	82%
Reflective	14	11%

TABLE 1. Students' response by Emotional Level.



STUDENT NAME:_____ T.A. or Section #: _____
(Page 1 of 3)
Introduction to Design Thinking 1101
Special Assignment 2: Applying Norman's 3 Levels of Emotional Design to face masks
DUE:11:59pm on Sunday March 14, 2021

Recently, you participated in a survey regarding your experiences with pandemic face masks. You watched an asynchronous online class lecture and read a case study which introduced you to Don Norman's 3 levels of Emotional Design. The exercise below will assess your understanding and application of Emotional Design present in a pandemic facesmask. ***Satisfactory completion of both Part 1 and Part 2 of this exercise is required to receive 5 points.***

Assignment Part 1: Identifying and Applying
(Figures 1-3) show different views of the same pandemic face mask. **WRITE** in at least 3 to 4 sentences, explaining: How the design of the face mask **does or does not** reflect each of Norman's 3 levels of Emotional Design (Figure 4) and **which level is the most** prominent in the face mask and why.

Figure 1 Figure 2 Figure 3

Level:	Level:	Level:	Most prominent

STUDENT NAME: _____T.A. or Section #: _____
(Page 2 of 3)

Assignment Part 2: Ideating, Creating and Applying
In the space provided sketch some rough prototypes of your own design for pandemic face masks. You will **not be graded** on drawing skills. (Additional sketching and writing space on the next page.) Out of your rough sketches **CIRCLE ONE** pandemic face mask design to consider further on page 3.

Rough sketches of face mask prototypes

(Page 3 of 3)
Assignment Part 2: Ideating, Creating and Applying
Below **WRITE** in at least 3 or 4 sentences an explanation of how **your selected design** represented each level of emotional design.

Level:	Level:	Level:

Use the extra space here for sketching or writing.

FIGURE 2. The three steps for the Design CUE exercise.

Transfer is an active, dynamic process and not the final product of some sequential steps in learning or a passive end-product approach (Hajian, 2019). The Norman exercise serves as a practice for transfer. The goal of practice for transfer is to make sure that what students practice can be applied in other situations—without a teacher needing to help make the connection for them. The Norman exercise was administered asynchronously online where students were required to make connections on their own after viewing a lecture on emotional design and reading chapter 3 of "*Why we love (or hate) Everyday Things"* (2004) in which Norman gives a case study applying emotional design to NFL football coach headsets. Followed by viewing a TED®Talk titled *Why Good Design Makes Us Happy* and a lecture on Emotional Design Theory.

We know in design disciplines, contrasting cases (Perkins & Salomon, 1992) offers a method that can be used when a student needs to learn both the general and special characteristics of a subject. For example, by applying Norman's emotional design to a product that is well known to students (face masks) they would then be able to contrast a single case (NFL Headsets) with a contrasting case (pandemic face masks) enabling students to recognize and apply their understanding in ways they did not see possible beforehand. The students would be able to recognize that they already have some knowledge of Emotional Design, as they apply it to the new case, and then either work with that knowledge or build upon it in future cases using other frameworks such as Kensei Affective Design (Nagamachi, 2008) and Positive Design (Casais et al., 2016).

Researchers Perkins and Salomon (1992) coined the terms "low-road transfer" and "high-road transfer" to describe these different levels of transfer. Transferring knowledge or skills from one task to another very similar task is known as low-road transfer. When students are just starting out, low-road transfer tasks can help them gain independence and confidence working with new material.

Conceptual frameworks like Norman's emotional design can be transferred to any design discipline. This is ideal for an introductory design course, especially a Design Thinking course, where empathy is a key factor in design process models such as the one used by IDEO® and Stanford's d-school. In this way,

having novice designers learn the Norman framework can be thought of as a gateway to developing empathy through understanding the visceral, behavioral, and reflective cognitive processes of the users for whom they will design.

Concept association is assumed to be a key notion in design thinking during concept synthesis (Yamamoto et al., 2009). In this case, their own face mask design helps them in synthesizing multiple abstract concepts (visceral, behavioral, and reflective cognitive processes).

I designed this concept-based assessment (Erickson & Lanning, 2014) to guide students through a 3-part learning structure. The entire course unit on Emotional Design Theory was structured on the six parts of Bloom's Taxonomy, version 2 (Anderson & Krathwohl, 2001), and an integrative approach to course design (Fink, 2003).

The exercise involves taking newly obtained information and applying it to an existing design followed by taking iterative design steps sketching rough prototypes of their own designs followed by transferring newly acquired knowledge to the application of one of their own designs. Therefore, I created the Design CUE using a W-D-W (writing-designing-writing) format to provide a simple framework whereby students apply the levels of emotional design. The exercise was designed to help students communicate their thoughts (Maeda, 2017) which helps make learning stick (Brown et. al, 2014) by using design thinking in a "picture-word cycle" where students can "put ideas into words to help clarify and elaborate on ideas" (Razzouk & Shute, 2012, p.342).

When bringing concept and process together concept-based exercises are a means to invite students to explain the relationship of factual or situational examples and performances through a conceptual lens (synergistic thinking) so that students' thinking is made visible to both the student and instructor.

Concept-based curriculum design advocates limiting the amount of information to be studied and applied to ensure students have ample time to deeply process ideas. Short, structured concept-based exercises like the Design CUE, require students to span multiple areas; task commitment, synergistic thinking, depth of understanding, conceptual thinking (critical, creative, and reflective), and conceptual visualization (Erickson & Lanning, 2013).

I designed the exercise to promote a reflective design process and offer consideration for future development as design pedagogy. The exercise format both fits with the current "outcome focused" approach where students are eager to complete tasks and finish assessments with a process-based learning task which is crucial for student education and development as good designers (Taboada & Coombs, 2013). Because the objectives of the exercise focus on pandemic face masks, it was in keeping with the trend in design education toward problem-seeking (rather than problem-solving) with an understanding of theory and the practice of design (Keane & Keane, 2002).

Each student's response to the exercise was evaluated by two instructors to ensure consistency in scoring. The exercise was worth 5 points and the assignment needed to be satisfactorily completed according to specific requirements. Partially filled-in sections or failure to submit the exercise received a zero. All but 2 study participants received 5 points for completing the exercise. A total of 126 students completed the assignment and the mask prototype output totaled 421.

FAILURE ANALYSIS

"The identification of the factors in the potentially useful education activity and the organization or construction of sequence in curriculum are in principle amenable to an infinite number of combinations," Eisner writes: "The variables teacher, student, class group, require artful blending for the educationally valuable result." (Eisner,1967, p.549).

Reviewing the Design CUE Exercise Against Educational Objectives

In creating designs for learning, we know one of the reasons for design failure may be attributed to shortcomings in clarifying educational objectives. In analyzing where the Design Cue may have failed to produce the results I wanted, I reviewed Marzano's Taxonomy (2000) which was developed to respond to what he believed were the shortcomings of the widely used Bloom's Taxonomy which was then used to structure the Emotional Design course lesson unit.

Marzano's New Taxonomy (see Figure 3) is made up of three systems Self-System, the Metacognitive System, and

The Three Systems and Knowledge

Self-System		
Beliefs About the Importance of Knowledge	Beliefs about Efficacy	Emotions Associated with Knowledge

Metacognitive System			
Specifying Learning Goals	Monitoring the Execution of Knowledge	Monitoring Clarity	Monitoring Accuracy

Cognitive System			
Knowledge Retrieval	**Comprehension**	**Analysis**	**Knowledge Utilization**
Recall Execution	Synthesis Representation	Matching Classifying Error Analysis Generalizing Specifying	Decision Making Problem Solving Experimental Inquiry Investigation

Knowledge Domain		
Information	Mental Procedures	Physical Procedures

FIGURE 3. The Three Systems and Knowledge (Used with permission, Intel®. 2012).

the Cognitive System and the Knowledge domain. When faced with the option of starting a new task, the Self-System decides whether to continue the current behavior or engage in the new activity; the Metacognitive System sets goals and keeps track of how well they are being achieved; the Cognitive System processes all the necessary information, and the Knowledge Domain provides the content.

In education, the Knowledge Domain has traditionally been the focus of most instruction. Students were assumed to need a significant amount of knowledge before they could think seriously about a subject. Knowledge is a critical factor in thinking. Without sufficient information about the subject being learned, the other systems have very little to work with and are unable to engineer the learning process successfully.

My goal for the Emotional Design course unit within the study and the creation of the Design CUE was to go beyond what Marzano refers to as knowledge forgotten after the final test. Before the creation of the Design CUE, Emotional Design theory was relegated to an exam question. Marzano identifies three categories of knowledge: information, mental procedures, and physical procedures with information being the "what" of knowledge and procedures the "how-to." Information consists of organizing ideas. The Design Cue enables students to organize their ideas and place levels of emotional design into categories, this is an important feature because according to Marzano categories allow students to store more information with less effort. Mental procedures ranged from completing a user experience survey, watching a video, attending a lecture, reading a case study on Emotional Design, and completing the writing portion of the Design CUE. The physical procedures were the sketching of rough prototypes.

According to Marzano, the Cognitive system involves mental processes which act on the knowledge domain giving students access to the information and procedures in their memory and helping them manipulate and use this knowledge. The Cognitive System is comprised of four components each composed of the previous process: knowledge retrieval, comprehension, analysis, and knowledge utilization.

Knowledge Retrieval, like the Knowledge component of Bloom's Taxonomy, involves recalling facts, sequences, or processes exactly as they have been stored. Comprehension requires identifying what is important to remember and placing that information into appropriate categories. Therefore, synthesis is the first skill in comprehension, which requires the identification of the most important components of the concept in the context in which it is learned, so the information that is stored may vary by situation and student. Through representation, information is organized into categories that make it more efficient to find and use. Marzano believes graphic organizers encourage this cognitive process. The Design CUE was created to engage in all these processes.

Failure to Aid Students in Knowledge Utilization

Knowledge Utilization is the final level of cognitive processes, and it is at this level that the Design CUE may have failed in aiding students in decision-making. The processes of using knowledge are especially important components of Design Thinking for project-based learning since they include processes used by people when they want to accomplish a specific task. Knowledge utilization by way of the cognitive process of decision-making may have been the most difficult task for students in completing the Design CUE.

Decision-making involves weighing options to determine the most appropriate course of action. When I read the students' written portions of the Design CUE, it was evident that some of them attempted to give equal weight to the three levels of emotional design in their own designs which was not a requirement. In fact, the difficulty in balancing emotional design levels in an artifact was addressed by Norman in the assigned design case reading. The Design CUE instructions should have clarified that equal application of the three levels of emotional design within one face mask was not a requirement. It is not known if the teachers administering the Design Cue addressed this matter verbally with students when going over the instructions and I did not specifically instruct them to do so.

Failure to Provide Clear Assessment Objectives

A rubric was discussed between the lead instructor and me, however, we decided that because the teaching assistants were adjusting to several changes in the course due to Covid-19, we would keep the Design CUE scoring pass/fail. However, because there was no rubric with which to assess the actual designing portion of the exercise, the instructors gave students passing scores based on the application of design theory in the written portion of the exercise, had there been a rubric, the instructors could better assess the design portion of the exercise.

Likewise, students were not given a rubric which may have affected their perceived importance of part 2 of the Design CUE.

Failure to Motivate Student Achievement

In my failure analysis of the course unit design and the creation of the Design CUE when applied to Marzano's taxonomy (see Figure 3) I considered the Self-System which is comprised of the attitudes, beliefs, and feelings that determine an individual's motivation to complete a task. The factors that contribute to motivation are importance, efficacy, and emotions. Importance according to Marzano is when a student is confronted with a learning task, one

of their first responses is to determine how important the task is to them in this case; is Emotional Design Theory something they want to learn or believe they need to learn beyond the course?

I initially considered if the Self-System was affected by the low number of points awarded for completing the Design CUE. In the totality of the Design Thinking course, 5 points is not significant. Prior to the creation of the Design CUE, the Emotional Design Theory exam question was also worth five points. Completing the DESIGN CUE exercise took considerably more effort compared to answering the exam question. However, when reviewing the research data 126 out of 128 students completed the survey and the exercise and received 5 points for each. It is evident that the number of course points did not hinder motivation.

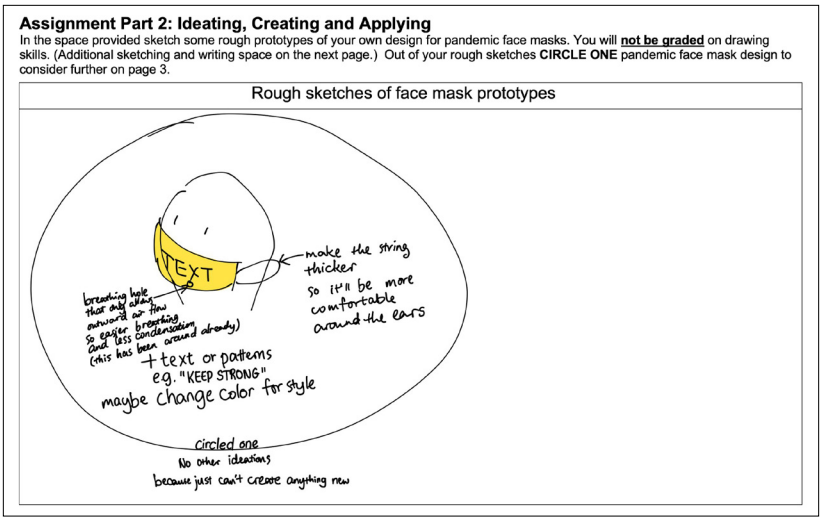


FIGURE 4. Example of Self-System impact on student work.

Another impact on motivation is efficacy, which refers to people's beliefs about their ability to accomplish a task successfully, Students with a high degree of self-efficacy face challenging tasks head-on, with the belief that they have the resources to be successful (Marzano, 2000; Bandura, 1994).

I considered whether the drawing portion of the Design CUE may have been affected by students' self-efficacy despite the directions specifically stating that drawing skills would not be assessed. Students were also able to use drawing tools on their devices rather than sketching on paper. Some students who completed the Design CUE were not design students, so I did not expect as much from them in the prototype portion of the exercise, as I expected from the design majors. However, students outside of the design majors did as well if not better on the written portion of the Design CUE and indicated in writing inventive product features alongside rudimentary sketches. Without inquiring directly with students, I can not ascertain whether emotions regarding self-efficacy in the prototyping task impacted their motivation.

What Failure Looks Like

Another example of the Self-System at work in relation to the Design CUE can be seen in (see Figure 4) this graphic design student wrote by their design, "Circled one, no other ideations because just can't create anything new." Marzano believes effective learners use their metacognitive skills to help them deal with negative emotional responses and take advantage of positive responses. This student's writing displays a defeatist attitude about the potential for innovation. In Marzano's view, this student could better deal with the negative emotion by focusing on what they could do, for example, decide to focus on the Visceral level of emotional design, which Norman states is" concerned with appearances." In the study, 82% of students indicated the precedent face mask had no visceral level or a negative visceral level of emotional design. If for example, this student chose to focus on surface design the possibilities could be considered limitless as the mask would serve as a blank canvas for graphic designs and fabrications.

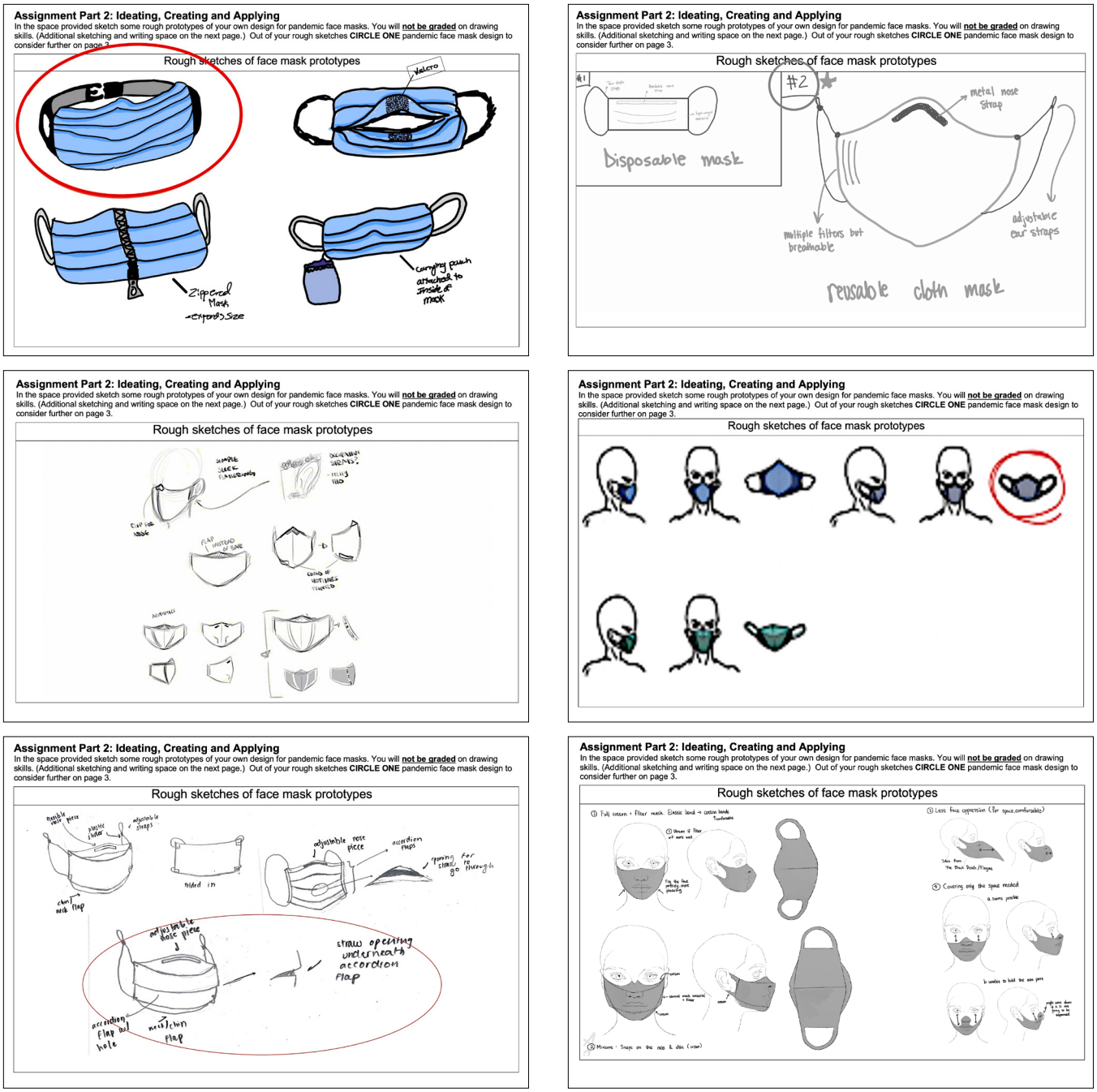
In summation, by applying Marzano's taxonomy, I assessed the potential reasons for failure that occurred in "How" students design face masks in application to the three levels of emotional design.

Failure Due to Use of Precedent and Principles

Other considerations for failure included the choice of face masks as opposed to another artifact to teach emotional design theory. The intent was to use an artifact that students had experience using and in the context of a pandemic and mask mandate they were likely to be emotional about. However, I am not convinced the task of designing face masks was problematic.

In reviewing the completed part 2 of the Design CUE (see Figures 5-10), the decision to use the blue face mask as the design precedent may have contributed to the failed expectations of the Design CUE to cue student creativity especially in designing the visceral level of emotional design. The examples of student face masks in Figures 5, 8, and 9 prototypes resemble the precedent in coloration, pleated style, or both. The remaining 3 examples (see Figures 6,7, and 10) resemble commonly worn face mask designs with no distinguishing features. These examples are also some of the best prototypes of the 421 submitted.

Perhaps the image of the blue pandemic facemask affected student emotions (Marzano & Kendall, 2008) or as experienced users, the student designers had developed the ability to size up the face mask situation rapidly and determined



FIGURES 5-10. *(left to right, top to bottom)*
Student facemask prototypes.

the fit, if any, between the potentials embodied in precedent and the current situation (Boling, 2010; Cross, 2004; Lawson, 2004; Thomas & Carroll, 1979) or because students were tasked with "generating potential solutions based on principles," in this case three levels of emotional design, these principles became "straightjackets which diverted the student designers attention from what really matter[s]" (Boling, 2010; Archer, 2004).

In this design case, Bloom's revised Taxonomy highest level CREATE also comes into question. The level is defined as producing new or original work. Further defined as design, assemble, construct, conjecture, develop, formulate, author, and investigate. Although the students achieved some aspects of the CREATE level, as the stakeholder, I did not see new or original work to my satisfaction as a designer. Creative problem-solving occurred, but the design solutions were primarily addressing the behavioral level of emotional design. As design is an iterative process, I expected to see iterations of existing face masks but what I did not anticipate were replicas of the precedent nor a significant lack of face masks addressing the visceral level of emotional design which also affects the reflective level. Especially given that

82% of students (see Table 1) stated the visceral level was missing in the blue surgical mask example.

Design Constraints in Educational Context

As with any design, the Design CUE was created under constraints.

In consultation, the lead instructor specified the Design CUE exercise needed to efficiently fit into an existing class calendar that had many assignments due the same week reducing the time students could spend creating facemask designs.

In completing the exercise, students could not be required to purchase art supplies or to attain design software to use to design their face masks. The exercise needed to be accessible to students who did not have a computer or easy access to a shared family computer as many students were at homes with one computer. Therefore, the exercise needed to be able to be used digitally or printed on paper and visually understandable whether printed in color or black and white. The Design CUE also needed to be understood by ELL students as several international students were enrolled in the class.

Improvement Plans

Prior to assigning students the Design CUE, a staff meeting was held to go over the exercise in the context of the research, teaching and learning and to gather input. The Design CUE was reviewed by 6 staff and an outside advisor, any shortcomings with the learning design were not brought into question.

However, one improvement to the Design CUE, might be a fourth section for reflection requiring students to answer the question "How does your design make people happy?" in reference to Norman's TED® Talk "Why good design makes people happy" which students were assigned to view prior to completing the exercise. This addition may increase the visceral level of emotional design in the students' prototypes.

As addressed in the previous section on knowledge utilization failure, an addition to the written instructions clearly stating that students did not need to design for all three levels of emotional design equally may improve the prototype design objectives.

Improving future instruction would include requiring teachers to include step-by-step discussions of each part of the Design CUE with the class as opposed to simply posting the assignment online.

The use of the blue pandemic face as a precedent could also be removed from the Design CUE. If so, students could select a mask themselves to discuss the three levels of emotional design. Or a precedent could not be used at all. Students would design their own masks in application to the 3 levels of emotional design.

A rubric with clearly defined expectations for the entire Design CUE exercise, specifically the designing portion would be given to students as a supplement to written and verbal instruction.

Lastly, interviews with students from the study could be conducted regarding the learning experience of the Design CUE to better understand how it might be improved.

The Design CUE in Social Context

The online nature of the course due to the pandemic may also have been a contributing factor.

The global pandemic caused widespread disruption at all levels of education. The pivot from in-person to online instruction was unplanned and forced students and instructors into an uncertain, online environment (Bacher-Hicks et al., 2021). The Design Thinking course in which the study took place was entirely online asynchronously with one discussion period per week via zoom.

Even before the pandemic, taking a course online, instead of in-person, reduced student success and progress in college (Bettinger, Fox et al, 2017). A recent study (Kofoed et al., 2021) found during the pandemic "online learning reduced final grades by a half +/- grade; a result that increased for lower ability students and concentrated among students who were the most academically at-risk." Their post-course survey showed that online students experienced reduced concentration and felt less connected to their instructors and peers. They also claimed that their instructors cared less about them.

Given Kofoed's findings, the pandemic's effect on students' Self-System (Marzano, 2000) must be taken into consideration when analyzing learning design failure.

CONCLUSION

In this design case, I have described the creation of an instructional design exercise used to teach emotional design theory in application to a designed artifact. Through this design, I intended for students to build both theoretical and practical skills that would enable their success in subsequent design courses and ultimately their future careers. While the design was largely successful in teaching theory and providing a framework for students to organize their thoughts in the act of creative problem-solving, it fell short in relation to practical application, specifically in "cueing" student innovation in one or more levels of emotional design.

This design case is useful in the study of instructional design and understanding where it can fail. Although the primary purpose of the research study was focused on teaching

theory, as a design case, I expected the application of Emotional Design Theory utilizing the Design CUE would produce more creative designs.

ACKNOWLEDGMENTS

Special thanks to: Dr. Brad Hokanson, University of Minnesota; Professor Emeritus Dr. Marilyn DeLong, University of Minnesota; and Pat Hemmis, Ph.D, Retired, University of Minnesota

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