

Using Images to Engage Online and On-Campus Students in Meaningful Reflection

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Abstract

This study employed an exploratory, mixed methods design to investigate the impact of visual representations when used as reflection on students' perceptions of a graduate level Research Methods in Agriculture class. Qualitative data suggested visual reflections were well received by students. Six themes were identified: novelty of visual reflections, visual reflections were a positive addition to the class, visual reflections had a positive impact on students' course performance, visual reflections had a positive impact on students' management of their stress, visual reflections had a positive impact on student-instructor connectedness, and visual reflections had a positive impact on student-student connectedness. However, there were no statistically significant differences in students' perceptions of the instructor's verbal immediacy, affective learning, or academic stress between those that engaged in visual reflections and those that did not. Although the quantitative findings of this study were not significant, the qualitative findings suggest visual representations can provide a well-received method of reflection for students.

Introduction

Researchers have long regarded reflection as a crucial part of the learning process (Boud et al., 2013); however, the mode of reflection can vary. While some students may prefer written reflections, others may prefer verbally reflecting in a classroom setting (Lamm et al., 2011). Additionally, "one form of reflective practice may not fit the needs of all students" (Lamm et al., 2011, p. 132). According to Lamm et al. (2011), it is most important that students are provided with reflection opportunities that "accommodate a variety of learning styles" (p. 132). The mode of reflection may influence an individual's attitude regarding the value of the reflective practice,

which could in turn negatively impact the reflective experience (Dewey, 1933); "*the attitudes an individual brings to bear on the act of reflection could either open the way to learning or abstract it*" (Husu et al., 2008, p. 39).

The brain can process information via two modes: semantic processing, which involves linguistic expression, and nonlinguistic processing, which involves the construction of images of information (Marzano, 2010; Paivio, 1990). Learning through nonlinguistic representations, which requires students to process information by constructing representations of information and then explaining those representations to others, allows students to explore their perceptions and understanding about a concept without reliance on language (Marzano, 2010). Students who learn through nonlinguistic representations generate greater brain activity, as they store knowledge both linguistically and visually (Bamalli, 2014). The positive impacts of nonlinguistic representations on K-12 students' learning have been well documented – Haystead and Marzano (2009) found that, across 129 action research studies with one class employing nonlinguistic strategies and another employing linguistic strategies to learn the same content, students engaging in nonlinguistic learning strategies experienced a 17 percentile point gain in student achievement on average.

While nonlinguistic representations have been used to assist students in learning content, little information is known about the impact of nonlinguistic representation as a means of reflection. The benefits of nonlinguistic representations and necessity for reflection in the learning process warrant investigation into the impact of nonlinguistic representations in reflection on student success.

When used as a learning tool, nonlinguistic representations can take on many forms, including "*graphic organizers, sketches, pictographs, concept maps, dra-*

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matizations, flowcharts, and computerized simulations, to name a few” (Marzano, 2010, p. 84). Marzano (2010) issued five characteristics of nonlinguistic representations, recommending teachers keep these in mind when employing nonlinguistic representations as a means of processing content. First, they come in many forms, and teachers should select the form of the nonlinguistic representation based on time available and content addressed. Next, they must identify crucial information; *“nonlinguistic representations that fail to focus on crucial information can have little or no positive effect on student learning”* (Marzano, 2010, p. 85). Third, students should explain their nonlinguistic representations. This explanation can assist students in drawing linguistic understanding from their nonlinguistic representations of the content. Nonlinguistic representations can take quite a bit of time when students are constructing them – teachers should consider this characteristic when utilizing this learning tool. Lastly, students should revise their nonlinguistic representations as they gain deeper understanding about a topic, similar to the way in which they would add to or correct their notes in class.

The act of reflection is more focused on the processing of information in relation to oneself. Dewey (1933) defined reflective thought as a controlled approach to thinking that allows the thinker to be more aware of the link between actions and consequences. Reflection, after taking action and experiencing the subsequent effect, *“reveal[s] forgotten choices”* and *“expose[s] hidden alternatives”*, which may be considered when taking future action (Lynch, 2000, p. 36). Rodgers (2002) summarized Dewey’s recommendations on quality reflective practice into four criteria. First, reflection is a process by which a learner moves from one experience to the next with a deeper understanding of how the experience is connected to other people’s experiences and ideas. Next, reflection consists of several phases: spontaneous interpretation of an experience, identification of the problems or questions that result from the experience, generating possible explanations for the problems or questions, developing and testing the explanations, and efforts to solve the problems posed. Reflection also needs to include interaction with others. *“This is crucial because expressing one’s ideas or thoughts to others with sufficient clarity for them to understand, reveals both the strengths and weaknesses of one’s thinking”* (Husu et al., 2008, p. 38). Lastly, reflection requires the individual to acknowledge the value of one’s own personal and intellectual growth, as well as the growth of others.

Purpose and Objectives

This study employed an exploratory, mixed methods design to investigate the impact of visual representations when used as reflection (hereafter referred to as visual reflections) on students’ perceptions of a graduate level Research Methods in Agriculture class. The qualitative component of the study occurred in the fall semester of 2015 and was designed with the purpose of

understanding students’ perceptions of visual representations when used as a reflective exercise. Objectives were to describe students’ perceptions of 1) the nonlinguistic reflection assignments; and 2) the assignments’ impact on their experience within the course and with the instructor. The quantitative component of the study occurred in the fall semester of 2016 and was designed with the purpose of determining the impact of visual representation assignments when used as reflective exercises on students’ affective learning, academic stress, and perceptions of teacher immediacy. The dependent variables of the quantitative study were developed as a result of the themes that emerged from the qualitative study. Objectives were to 1) describe the affective learning, academic stress, and perceptions of teacher immediacy among students who did not engage in weekly visual reflections during a research methods course and those that did; and 2) determine the differences in mean scores of each variable between the two groups. The University of Arkansas Institutional Review Board approved both components of the study and all participants provided written informed consent prior to participation in the study.

Methods

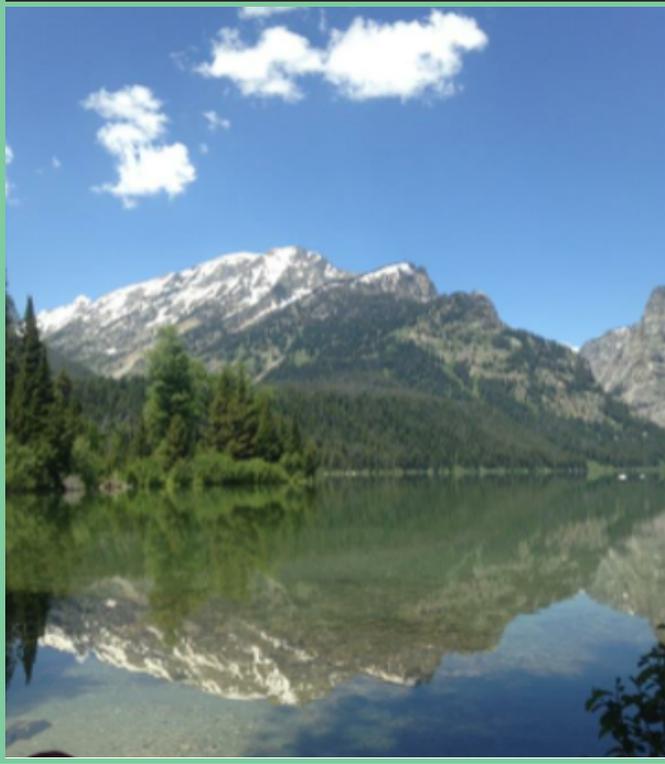
Qualitative Component

The qualitative component of the study was carried out in a graduate level Research Methods class in the College of Agriculture, Food, and Life Sciences at the University of Arkansas. This course was delivered in a combined face-to-face and online format. All students in the class (N=30) were asked to complete weekly visual reflections regarding their feelings related to the course content. The visual reflection assignment was designed to align with the criteria for visual representations (Marzano, 2010) and reflection (Rodgers, 2002) as they intersected with one another. Each week, the assignment instructions read:

Through an internet search, find one image that accurately portrays your relationship with this class. Essentially, you should be finding an image that shows how you feel about embarking on this adventure in learning about research methods. Copy the image to a word document. Below the image, type one paragraph explaining why you selected this image and how it represents your feelings. There are no wrong answers, so be honest! Your honesty will help classmates who might feel the same way and will help me adjust instruction to meet your needs, strengths, and concerns. These images will be discussed each Thursday during our class meeting, so be sure to submit by Wednesday night.

Visual reflections were highlighted each week, with between eight and 12 students’ reflections being highlighted. Those that were highlighted were selected by the instructor according to level of detail in the students’ provided explanations; reflections that suggested careful selection of an image to display the student’s thoughts were selected to be highlighted. The number of reflections selected each week was dependent upon

Figure 1. Student visual reflection. Students provided their visual reflections along with an explanation justifying their image selection. Visual reflections were intended to depict a student's feelings regarding the class at the time.



the amount of time the instructor anticipated other course content would require; the course was scheduled for 90 minutes. Students were given the opportunity to verbally explain their image and how it represented their feelings toward the class to the other students. The online students participated in discussion via an online meeting room each week. Dialogue regarding images and explanations, including statements of agreement, appreciation of the use of specific images, and content-related assistance occurred naturally among the class throughout these presentations each week. An example of a student submission is displayed in Figure 1, accompanied by the student's explanation:

The student explained, *"just taking a moment to survey the task in front of me, but also admiring where I have come so far. I feel like I have learned new things about research that I had not seen before, but also apprehensive of the mountain of work in front of me. I will be successful, but not without a workout!"*

At the end of the visual reflection discussion, the instructor would share her own visual reflection in response to the students' reflections. An example of one of the instructor's visual reflections is shared in Figure 2, with the explanation below:

During the second week of class, after most students had submitted visual reflections that displayed their nervousness about the next 14 weeks. In response, I, as the instructor, shared this visual reflection with them, explaining, *"In the Polar Express, the children aren't sure what's in*

store for them. Some are worried. The mountain they're climbing is pretty scary looking. But the conductor has done this a million times. He's not worried or nervous. The train he's got them on is warm and safe. I'm the conductor – I've helped many students conquer the mountain of research methods. Just stay on the train with me, and it will be a great ride!"

Typical case sampling was used to recruit students from the population (Flick, 2006) for data collection; students were selected using simple random sampling from among those who earned overall course grades above the lowest quartile. Because the qualitative component of this study was designed to inform the subsequent quantitative component, participants were recruited one at a time until data saturation was reached. Students' responses yielded very uniform data, leading to a sample of four. Data was collected via one-on-one interviews conducted face-to-face for on campus students (n=1) and via an online meeting system for students taking the course online (n=3). An interview protocol was approved by the University's Institutional Review Board and used to ask respondents about their image selection process, their perceptions regarding the visual reflection assignments' impact on their stress management, feelings toward the class and content, focus on the course modules, and feelings toward other classmates and the instructor. Questions also asked students to speculate on their performance in the class, had the visual reflection assignments not been part of the class. All data were transcribed verbatim into Microsoft Word and analyzed via the constant comparative method (Glaser and Strauss, 1967). Rigor was established using Lincoln and Guba's (1985) evaluative criteria. Credibility was established through member checking, as all respondents were given copies of their interview transcripts and the themed data and asked to respond with any edits they had. Transferability was established via the description of the course, assignments, and students. Dependability

Figure 2. Sample of instructor's visual reflection. Visual reflections were provided to students with explanation regarding the selection of the image following the students' sharing of their visual reflections.



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and confirmability were established via triangulation with the subsequent quantitative portion of the study.

Quantitative Component

Online and face-to-face students enrolled in the fall 2016 graduate-level Research Methods course (N=31) were randomly assigned to a control (n=16) or treatment group (n=15), in which the treatment group submitted weekly visual reflections with the same instructions as in the qualitative portion. For the weekly assignments, students were asked to search for an image that represented their feelings regarding the course content for the week and include a justification for their selection. Again, the images were used to spur discussion during the treatment group's weekly classes.

While not found within the literature, themes uncovered in the qualitative portion led to the quantitative measurement of teacher immediacy, affective learning, behavior intentions, and academic stress. Teacher verbal immediacy was evaluated using Gorham's (1988) survey of verbal immediacy. While immediacy can be measured via verbal and nonverbal cues, the online nature of the class limited evaluation to only include verbal immediacy, as students did not have an opportunity to see the professor's nonverbal cues. One item ("Is addressed by his/her first name by students") was removed, as the university has an established culture of addressing teachers by "Doctor". Gorham initially calculated internal consistency using split-half and the result was 0.94. Nonverbal immediacy was not assessed because of the online class setting. The pilot test (n=13) of undergraduate agricultural education students led to a Cronbach's α of 0.88. Affective learning, including both attitude and behavioral intention, was measured using instrumentation created by McCroskey et al. (1985). The instrument measured attitude toward course content and instructor utilizing 7-step bipolar scales. The scales ranged from bad to good, worthless to valuable, unfair to fair, and negative to positive, with an internal consistency of 0.98 on the pilot test. Behavioral intention was measured to assess the likelihood of attempting to engage in behaviors recommended, likelihood of enrolling in another course of similar content, and the likelihood of enrolling in another course with the instructor. Scales ranged from unlikely to likely, impossible to possible, and improbable to probable with an internal consistency of 0.94 in the pilot test. Academic stress was measured by Lakaev's Academic Stress Response Scale (2006). The instrument assesses university students' stress in four domains: physiological, behavioral, cognitive, and affective. The pilot test yielded internal consistency scores of 0.67 for affective stress, 0.76 for behavioral stress, 0.86 for cognitive stress, and 0.89 for psychological stress. The instruments were combined to create one electronic instrument which was constructed using Qualtrics and distributed to students via email.

Per the protocol approved by the University Institutional Review Board, students in each group were asked to complete the full instrument via a link in an email sent

after the final exam for the course. A response rate of 96.8% (n=30) was achieved.

Results and Discussion

Qualitative Portion

Largely, data suggested visual reflections were well received by students. Data yielded six themes: novelty of visual reflections, visual reflections were a positive addition to the class, visual reflections had a positive impact on students' course performance, visual reflections had a positive impact on students' management of their stress, visual reflections had a positive impact on student-instructor connectedness, and visual reflections had a positive impact on student-student connectedness.

Novelty of Visual Reflections

All four respondents noted they had not experienced any assignment similar to the visual reflections in previous classes. This novelty was viewed positively by one respondent, who stated, "*it was nice to do something that was kind of out of the ordinary for courses. I'd never done anything like that before and it was kind of nice.*" (P1, lines 16-17). The other three respondents were wary about the assignments because of their novelty. One student stated they were "hesitant at first" (P. 3, line 8), adding, "*when we first started the course, I was not all that enthused about [the visual reflections]. I thought it was going to be kind of a waste of time*" (P3, lines 3-4). Another student worried the assignments might be busy work because they were "*unsure of the reason behind [the visual reflections] at first...it was the first time I had ever done anything like that in a class.*" (P4, lines 9-10, 4). The final respondent shared their angst with the terminology used in the assignment: "*I used to hate the word 'reflection'. It was like torture*" (P2, line 149). They shared that this initial distaste for reflection, based on previous experiences, led them to wonder about whether the additional assignment would be valuable: "*I know I'm going to have homework, I know I'm going to have this stress now, so I don't know if I'm going to love it or hate it. I'm thinking, 'oh god, what did I get myself in to?'"*" (P2, lines 43-44).

Visual reflections were a positive addition to the class.

While the novelty of the visual reflection assignments was not met with much enthusiasm, students' perceptions of their value changed by the end of the course. One student stated, "*at the beginning, I thought it was going to be a waste of time, but once I got into it after two or three weeks, I was like, 'alright, I enjoy this.'*" (P3, lines 80-81). They added, "*the visual reflections were my favorite part of the course, and so I think I would have had a less positive attitude throughout the course [if they weren't included in the course].*" (P3, lines 53-54). P4, who originally thought the assignments might be busy work, stated, "*it was a really positive thing. If I ever went into higher ed, or just education in general, as a teacher*

[the visual reflections] would be something that I would want to incorporate, just because I do feel like it had a positive impact and was something that helped me along the way" (lines 114-117).

The respondent who hated reflection *"actually started implementing it in [their] biology class."* (P2, line 27). For the student who viewed the novelty of the assignment as a positive attribute, that novelty continued to positively impact their views of visual reflection (P1, lines 56-58).

Visual reflections had a positive impact on students' course performance.

All respondents noted the positive impact the visual reflection assignments had on their course performance. This impact occurred as a result of the timing of weekly assignments and the self-evaluation required by the assignment. P1 summarized the weekly deadlines, noting the regularity as a positive attribute:

"It gave me a point in the middle of the week that I was like, 'okay, it's due on Wednesday and I know I need to get it done at that point.' And it was nice to be able to have that structure along with the Thursday articles and the Sunday commends and the components that were due on Sunday. It was nice to have that mid-week structure" (lines 39-42). One respondent noted, *"the way the class was set up, you basically had to be on at least three times a week, with the visual reflections and other components. As opposed to waiting till the last minute and just doing everything at once. It did help me continue to be checked in and always looking at the course"* (P3, lines 29-33).

P3 noted how this impacted their course performance: *"I would have had a lower grade, had it not been for the visual reflections...I probably would not have checked in as much."* (lines 58-59, 61). Similarly, P4 said that while the visual reflections were the first thing that was due each week, they actually did them last, so they could *"think about what I had read, what I had seen, and it just kind of helped tie everything all together."* (lines 52-53). While other assignments were due later, P4 used the earlier deadline of the visual reflections to avoid procrastination on the other assignments. Alternately, P2 used the visual reflections to set the pace for the rest of the week: *"I would do [the visual reflections] on Monday knowing that we have the article critiques to do and another component coming up."* (lines 76-77). Finally, P1 said the visual reflections helped them with their understanding of the content: *"If I realized I didn't quite understand a component, or a specific element of the curriculum, I would go back and reread or relisten to some audio lectures or relisten to some classes. I would do that a lot, just go back and relook to make sure I took the correct notes and understood it thoroughly...I'm not necessarily sure that I would have gone and evaluated myself as much [without the visual reflections]"* (P1, lines 73-75, 79 80).

Visual reflections had a positive impact on students' management of their stress.

Students noted the visual reflections helped them manage their course-related stress because they were able to acknowledge and define their feelings, express them in a productive manner, and then move on each week. P4 described the visual reflections as a *"good outlet to express myself"* (line 6). This student noted the actual process of finding an image to express their exact feelings made them more aware of exactly what they were feeling. When describing how they selected an image after entering a keyword into a search engine, they said, *"I kind of always had a general idea of what I wanted, but then seeing [the images], I was like, 'that doesn't really convey what I want...that's closer...' and then, 'ding ding ding! This is what I'm saying!'"* (P4, lines 43-45). P2 expressed similar feelings regarding the cathartic effect of the practice of selecting an image: *"It was an easy way to kind of sum up how I was feeling or how something kind of racked my brain a little bit. I was able to go on online and pick a picture and say, 'this is exactly how I was feeling'"* (lines 3-5).

P1 and P3 stated that the fun they experienced when completing the assignment lowered their stress. P3 stated, *"I was looking for funny little images and it kind of made me giggle inside and brightened up my Wednesday before heading home"* (lines 39-40). P1 noted, *"I just think looking for kind of pictures that reflected my feelings was kind of fun, so it probably lowered my stress level."* (lines 53-54). This student shared a particular instance when the visual reflection assignment allowed them to overcome their stress: *"I think it was right after the midterm, and I chose a cat with its head falling over, and at the time it was kind of like, 'ok, my brain is done for the moment.' But at the same time, it almost made me laugh enough to go, 'ok, that was kind of fun. I did it, I'm done with it, and now we can move on'"* (P1, lines 28-30).

Three of the four students noted that the visual reflections eased their stress because they were able to express their feelings to a person who could support them (the instructor) in a passive manner. P2 stated, *"[the visual reflections] let me release stress a little bit because I was able to say how I was feeling, and get it off my shoulders...I was able to put it down on paper, knowing that [the instructor wasn't going to take it in terms of 'oh, she doesn't like me'"* (lines 61-63).

This student also noted that, without the visual reflections, they would not have actively sought out a way to relieve that stress: *"I don't think that I would have gotten a chance to get it off my shoulders. I happen to be a person who sometimes internalizes things, so even if it's bothering me, I'll just kind of hold it in until someone finally asks about it and then I will explode. So those visual reflections gave me the chance each week to just let it out. Even if I was having that stress, I don't necessarily know if I would have went directly to [the instructor] and been like, 'ok, here's my email, this is what's going on'"* (lines 104-109).

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P4 echoed similar sentiments regarding the ease with which the assignments allowed them to share their stresses with the instructor: *"I was able to express my feelings without having to send someone twelve thousand emails that said, 'oh my gosh, I'm freaking out, this is terrible!'"* (lines 101-102).

Visual reflections had a positive impact on student-instructor connectedness.

While not as prevalent as other themes, three of the students noted that the visual reflections had a positive impact on the connection they felt to the instructor. When discussing the visual reflections shared by the instructor, P4 said, *"it helps to see the instructor's opinions, because [they] understand where we're coming from, [they] understand what we are feeling, and it's ok to feel that way"* (lines 81-83). P2 stated that the act of sharing reflections with the instructor acted as a safety net: *"[the instructor] is looking at our visual reflections each week and kind of sees which ones of us were maybe struggling a little bit more than the others...I think it was a way for [the instructor] to kind of spot check for us"* (lines 110-111,122).

P3 also appreciated the assignments as a *"great way to kind of check in with the instructor"* (line 5). However, P2 also suggested that the instructor's shared images also have them more relatable human qualities in an online class. They shared, *"I know that [the instructor] is a mom and has other things going on too, so I was like, 'I know she's going to understand and get this, and this is how I feel'"* (lines 65-66). Further, when reflecting on the instructor's shared images, P2 stated she could frequently relate to the instructor's feelings.

Visual reflections had a positive impact on student-student connectedness.

All of the respondents acknowledged the visual reflection assignments' role in connecting them with other students, particularly between on-campus and online students. Each of the students noted their appreciation when they could see that other students were going through similar emotions as they were. P3 noted, *"it was nice seeing some of the students were on the same page...We're all going through this thing together even though we are 30 to 1,000 miles apart"* (lines 44, 48). P4 described a similar feeling, stating, *"you miss that connection with people. Being a distance learner and learning where other people are from and how they're feeling and that we're all in the same boat, we're all dealing with the same feelings, and it's ok"* (lines 86-89). They also stated that seeing other students' visual reflections made them know, *"I'm not alone in this, someone else feels the same way"* (lines 64-65). P2 expressed similar notions, but also added that the selected images and explanations shared by classmates also *"let me see the personality of our fellow classmates, even though I couldn't physically see them, just by the graphics they were choosing, I was like, 'oh, ok, this person could be very similar to myself...this*

person has a very similar humor style as I do" (lines 99-101, 92).

Quantitative Portion

Perceptions toward the Instructor's Verbal Immediacy

Visual analysis of the data's histogram indicated one outlier, so a Mann-Whitney U Test was run to determine if there was a difference in perceptions of the instructor's verbal immediacy between those that engaged in visual reflections and those that did not. Distributions of scores for the groups were similar as assessed by visual inspection. Median perceptions of verbal immediacy for the treatment group (Mdn=69) and control group (Mdn=67) were not statistically significant, $U=115$, $p=0.87$, using an exact sampling distribution for U (Dineen and Blakesley, 1973). The maximum score possible on the Verbal Immediacy Scale was 80 (see Table 1).

Affective Learning

Again, outliers warranted use of a Mann-Whitney U test to determine if there was a difference in affective learning, as indicated by attitudes and behavioral intentions, between those in the control and treatment group. Median scores regarding students' attitudes toward the content were within half a point of one another, and, at most, 1.5 points away from the maximum possible score (see Table 1). No significant difference was found between the median scores of the treatment and control groups, $U=84.5$, $p=0.79$. With regard to students' attitudes toward the content and attitudes toward the instructor, both groups held maximum possible scores as median scores, obviously indicating no significant difference between the groups in either construct (see Table 1). Students' behavioral intentions with regard to the content yielded scores that were slightly higher among the control group, though not high enough to yield a statistically significant difference between the two groups, $U=94.5$, $p=0.95$ (see Table 1). Students' scores measuring behavioral intentions regarding the behaviors recommended by the instructor were within one-half a point of one another, and at most, 1.5 points below the maximum possible score (see Table 1). No signif-

Table 1. Median Scores of Treatment (students completing visual reflections) and Control (students not completing visual reflections) Groups and Maximum Possible Scores on Each Assessment

	Maximum Possible Score		
	Treatment	Control	
Perceptions of Instructor Verbal Immediacy	69.0	67.0	80.0
Affective Learning			
Attitude toward Content	26.5	27.0	28.0
Attitude toward Behaviors Recommended	28.0	28.0	28.0
Attitude toward Instructor	28.0	28.0	28.0
Behavior toward Content	24.5	26.0	28.0
Behavior toward Behaviors Recommended	26.5	27.0	28.0
Behaviors toward Instructor	28.0	28.0	28.0
Academic Stress			
Affective Stress	5.5	6.0	25.0
Behavioral Stress	13.0	11.0	40.0
Cognitive Stress	6.0	5.0	15.0
Physiological Stress	6.5	6.0	30.0

icant differences were found between groups, $u=95.5$, $p=0.98$. As was displayed with students' scores regarding their attitudes toward the instructor, both groups' behavioral intentions toward working with the instructor in the future yielded median scores that were the maximum possible score.

Academic Stress

Visual identification of outliers once again warranted use of a Mann-Whitney U test to determine if any differences in scores of academic stress between the two groups were statistically significant. Median scores for affective stress between the treatment and control groups differed by one-half of a point, and were not found to be statistically significant, $U=98.5$, $p=0.88$. Scores yielded a two-point difference in behavioral stress, with the treatment group indicating the higher level of behavioral stress; however, this difference was not significant, $U=134$, $p=0.34$. Questions related to cognitive stress yielded scores within one point of each other, again with the treatment group indicating the slightly higher stress load, although the difference was not significant, $U=110$, $p=1.0$. Finally, students in the treatment group yielded a slightly higher median score for psychological stress (0.5 points); again, the difference was not statistically significant, $U=118.5$, $p=0.47$.

Discussion/Recommendations

Findings from the qualitative portion of this study suggested the visual reflection assignments were perceived to be a positive addition to the class - students actually stated they preferred having the additional assignments over not having them. These findings not only support the notion that reflection is beneficial for students (Boud et al., 2013), but also suggest that students can be aware of the value of reflection when engaging in the practice themselves. While Dewey (1933) and Husu et al. (2008) posited students' initial attitudes regarding reflection could skew the benefits of the reflection, the students in the qualitative portion of this study actually experienced a change in perception regarding reflection as a result of the visual reflection assignments. Three of the four respondents were initially hesitant about the benefit of the additional assignments; however, rather than experiencing a lack of benefit, their perceptions regarding the value of the reflections improved as they completed more reflection assignments. This change of perception suggests that by shifting the mode of reflection to accommodate learners' preferences, learners' attitudes toward the reflective exercise may become more positive, which could in turn, improve their utility.

While the qualitative portion of this study yielded positive perceptions among students, when the outcomes they stated were assisted by the visual reflections were quantitatively measured, no differences in scores were found between students who completed visual reflection assignments and those who did not. These findings conflict with others using visual representations at the

K-12 level (Haystead and Marzano, 2009); however, those studies utilized visual representations as part of the learning process rather than as part of the reflection process, as was carried out in this study. These findings yield recommendations for both future research and for practitioners.

The quantitative measures indicated median scores that were frequently within less than two points of the maximum possible score. The data suggests a ceiling effect may have been present; essentially, the instruction delivered through the course, regardless of the visual reflections, yielded high perceptions of affective learning and of the instructor's verbal immediacy. Similarly, both groups' academic stress scores were low, suggesting a possible floor effect (as lower scores are more desirable on the Academic Stress Scale). Essentially, these findings support the notion that quality courses yield favorable scores with regard to instructors' verbal immediacy, students' affective learning, and students' affective stress. While we reviewed the literature to identify quantitative instruments aligning with the qualitative themes that were found, the ceiling and floor effects, combined with the conflicting data between the qualitative portion (the visual reflections were impactful) and the quantitative portion (the visual reflections made no impact), suggest that either the instruments were not varied enough in their range of scores, or the instruments measured constructs outside of the realm of the visual reflections' impact. We recommend researchers interested in assessing the impact of visual reflections seek out instruments that may offer greater ranges or other constructs.

The visual reflections, which added an additional 16 assignments to the students' workload, did not negatively impact the students' perceptions of any measured aspect of the course in either the quantitative or qualitative portion of the study. In fact, the qualitative portion of the study indicated students held favorable opinions of the visual reflections and perceived them to positively impact their performance in the course, academic stress, and relationships with the instructor and other students. Dewey (1933) noted that the mode of reflection can influence students' value of the reflective process, and these findings support his position. The data imply that while the visual reflection assignments may not yield a measurable difference on students' learning, they may improve the students' overall course experience in ways that have yet to be measured. Therefore, we recommend practitioners implement visual reflection assignments as a regular component of courses wherein academic stress may be high. The students in the qualitative portion of the study indicated their initial hesitation due to the novelty of the assignments, so we urge instructors to maintain consistency and regularity when implementing visual reflections; students indicated greater value in the visual reflections after they were comfortable with them and experienced benefits from them over the course of the semester.

Summary

Reflection continues to be a heavily-utilized component of the educational experience, and as one respondent in the study mentioned, its regular use can become tedious to students. However, the visual reflections added a sense of novelty to a learning practice with which the students were already familiar, renewing their interest in reflecting on their learning. While adding additional work to students' loads in a rigorous course can seem counterintuitive when seeking to improve students' experience in the course, the visual reflection assignments proved to be either a positive or neutral addition to the Research Methods course for two separate semesters. The low cost and low effort of the assignments, paired with the lack of findings implying any negative outcome of their addition, suggest instructors would serve their students well by exploring the prospect of implementing visual reflections. By altering the mode through which students reflect, teachers can guide students in finding value in productive reflection.

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