



Peer Reviewed

Title:

Arts Integration in Teacher Preparation: Teaching the Teachers

Journal Issue:

[Journal for Learning through the Arts, 7\(1\)](#)

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Publication Date:

2011

Publication Info:

Journal for Learning through the Arts, Center for Learning in the Arts, Sciences and Sustainability, UC Irvine

Permalink:

<http://escholarship.org/uc/item/65g5z7wp>

Acknowledgements:

The authors would like to thank the Educational Psychology classes, Fall 2008, for participating in our study. Jonelle Pool, Chair of the Education Department at Gettysburg College, teaches Educational Psychology. Charles Dittrich and Kenneth Pool, facilitated the arts-integration process used in this study,

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Keywords:

arts, art integration, curriculum, preservice, post-secondary education

Abstract:

This classroom study focused on modeling a hands-on approach for understanding classroom applications of multiple intelligence theory through arts-based integration. Thirty-five preservice



teachers enrolled in Educational Psychology classes participated in an interdisciplinary geometry lesson modeling Artful Learning™, experiencing an arts- based pedagogical approach in the lesson. Students identified and described geometric concepts and relationships and photographed geometrical elements authentically on campus as part of the model's original creation. Assessment of lesson objectives revealed that students appreciated arts-based pedagogy, but had difficulty translating theory into practice when creating their original lesson plans. Discussion includes reflective responses of preservice teachers to inquiry and arts-based classroom instruction for enhancing student understanding, as well as implications for integrating art pedagogy in professional practices.



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Exploring Multiple Intelligence Theory through Arts Integration

One of the primary goals of a teacher education program is to help preservice teachers develop pedagogical theory-based tools designed to assist student learning. In our experience, preservice teachers may believe that their history in grades K-12 is the gold standard for their practices, and they often overlook the implications of theory that challenge their personal paradigms for professional practices. When faced with new information, novices may discount the utility of what they are learning, because they have not personally experienced such practices. While Grossman (2005) notes that research on issues of instruction are important for teacher education, she also identified the paucity of research literature regarding how various approaches used by teacher educators might affect what is learned or believed about teaching and the future professional practices of preservice teachers. As college instructors in a teacher education program, we believe we are in a unique position to model, evaluate, and reflect on the effects of our pedagogical decisions regarding student understanding of content and practice. The purpose of this action research investigation was to use the college classroom to model pedagogy incorporating multiple intelligence theory through an arts-based focus to explore how preservice teachers represent curriculum content when planning lessons. We sought to better understand what preservice teachers believed about framing curriculum, instruction, and assessment, and how their pedagogical choices might facilitate or hinder student learning. By employing participatory and arts-integrated pedagogical formats for the lesson on multiple intelligences, we sought to provide a common experience for critical reflection on how our modeled pedagogical choices impacted preservice teachers' learning about the artistry associated with instructional strategy choices. We were also interested in discovering how preservice teachers view pedagogical alternatives to expository instruction.

Gardner's multiple intelligence theory (1983; 1998; 1999) provided a new platform for conceptualizing how students learn and understand content, acknowledging that students often exhibit immature cognitive conceptions, or an "unschooled mind," that limit true understanding. Most educational psychology text books include discussions of Gardner's multiple intelligences, sometimes critiquing the insufficient research evidence for clearly defining intelligence. Intuitively, however, Gardner's model seems to resonate with educators' experiences regarding student understanding and misconceptions. Having said this, the authors are struck by how few preservice teachers employ an instructional strategy design that employs a multiple intelligence-based format. Far more frequently, we see early teaching efforts framed in expository, direct instruction, i.e., the teaching is telling mode. Furthermore, in our experience, even *after* readings and discussions of multiple intelligence theory, expository instructional choices dominate among preservice teachers, even when it is clear that there may be more effective instructional design choices for conveying content and true understanding. Gardner's work raises consciousness about how best to create a genuine understanding of concepts in learners rather than a "rote, ritualistic, or conventional performance" (1983, p.9), and nudges educators to seek new pedagogical strategies to enhance meaningful learning.

While awareness and attention to multiple intelligence theory would likely help preservice teachers to think more creatively about their pedagogy, additional research on the value of the arts for influencing learning and teaching is currently being reported in the professional literature. Recent work by Gazzaniga (2008) suggests that the arts provide benefits for improving motivation, attention, and cognition. Supported by the Dana Foundation, Gazzaniga summarizes a number of findings that discuss preliminary evidence that exploration in the arts impact brain functioning by influencing the development of sequencing, manipulation of semantic information, and motor learning skills. Hetland, Winner, Veenema, and Sheridan (2007) conducted a meta analysis of studies that attempted to show a relationship between student participation in the arts and improved academic performance. Their work reveals evidence suggesting a causal relationship between the arts and non-arts based cognition in both drama and music. Causal relationships were established for drama in improving reading readiness and reading achievement scores, oral language skills, and story understanding (Podlozny, 2000). Listening to classical music improved short-term performance on some spatial tasks (Hetland, 2000a), and classroom

music programs where children experimented with instruments, improvisation, and movement improved performance on some paper and pencil spatial tasks (Hetland, 2000b).

Hetland et al. (2007) challenged arts education advocates to begin the process for designing and implementing studies that more clearly identify the benefits of arts education. They identify eight habits of mind that are directly taught by the arts, including engaging and persisting, using tools for expression, envisioning, expressing, observing, reflective questioning and explaining, and stretching and exploring without a preconceived plan, as well as an understanding of the history and practice of the arts. Their work links well to Gardner's theory through its encouragement of a variety of art-related paths to learning and deeper student understanding. Perhaps educators who explore alternatives (for example, bodily kinesthetic or visual spatial instruction) to more dominant cognitive linguistic instructional models may reach a wider variety of learners. However, the instructional strategy chosen must also be appropriate for the concept under consideration in order to yield maximum student understanding (Pashler, McDaniel, Rohrer, Bjork, 2009).

Gadsden (2008) also notes the increasing potential of the arts to influence pedagogy, practice, and student learning. Her extensive review of research consistently identified the potential of the arts for integrating curricula as well as the need for active inclusion of the arts in teacher preparation. According to Bresler (2001) and Bresler & Ardichivilli (2002), arts integration has the potential for bridging local and global cultures across time and space, which, therefore, may have implications for teaching diverse learners, a primary concern for the 21st century. A renewed focus on the contribution of the arts provides distinct value in our attempts to understand and address the newest and most difficult challenges associated with teaching and learning.

While a number of arts-based curriculum models exist, the Artful Learning™ model provided a successful, arts-based focus for integrating curriculum in the teacher education program. Artful Learning™ (1996) focuses on K-12 school improvement and is inspired by the vision of Leonard Bernstein, who observed that the artistic process for both creating and experiencing art is a fundamental way of learning in any discipline. In addition to its arts-based focus, the Artful Learning™ model is concept-based and interdisciplinary, with teaching and learning centered on the exploration of masterworks, the asking of essential questions (Wiggins, and McTighe, 2005), rigorous scholarship, active creation, and deep reflection. The core of Artful Learning™ encompasses a four-phase learning sequence: experience, inquire, create, and reflect. The learning sequence unfolds in an active, hands-on manner, with teacher and students sharing the roles of artist, teacher, and scholar. At Gettysburg College, the Artful Learning™ model was used successfully in undergraduate college settings (Robertson, 2007; Dittrich and Pool, 2008). For purposes of this study we related the discussion of multiple intelligence theory directly to an Artful Learning™ approach for exploring geometry. We hoped to model and motivate preservice teachers to explore the possibilities for integrating curriculum, encourage student inquiry, and reflect on the pedagogical processes that ignite student learning. Aligning with the Education department's curriculum and philosophy, Artful Learning's™ systematic approach for reflection and interdisciplinary inquiry supports our departmental beliefs related to meaningful learning, constructivist practices, content relevance, and addressing student diversity.

In an effort to prepare preservice teachers more effectively for reaching a wider variety of learners, we designed instruction to model an arts-based, hands-on approach for investigating our preservice teachers' beliefs about the application of multiple intelligence theory and its potential for enhancing student learning of geometry. Our design incorporated elements for engaging in critical reflection on learning related to mathematical content as well as the conceptualization of future pedagogical practices.

Methodology

Participants

Thirty-five undergraduate students, sixteen elementary and nineteen secondary, enrolled in two sections of Educational Psychology participated in the study. As a required entry-level class for

prospective teacher educators, participants were either first or second semester sophomores at Gettysburg College seeking teacher certification in one of 13 certificate areas. A goal of the Educational Psychology class is to help students develop an interest and an appreciation for the complex interaction of development, cognition, motivation, attitudes, and teacher-student relationships in the learning process. Additionally, we emphasize the need to maximize student success through differentiated instruction, reflective practice, and a thorough grounding in research on teaching and its ability to inform practice decisions.

Task

For this project we adapted a lesson on geometry in the real world described by Clark, Gronemeyer, Grover, Duncan, Stevens, and Wiles (1996) in which students demonstrate their understanding of geometric concepts and their relationships by identifying and describing geometric items in the real world. We selected mathematical content because our experience suggests that most students have experienced a traditional math curriculum without the benefits of creative pedagogy or arts integration. Secondly, this lesson was geared to the middle grade student, so it overlapped both the elementary (K-6) and secondary (7-12) certificate grade bands. The lesson aligned with middle level geometry standards (i.e. identification of geometry concepts and relationships) as the content focus for the lesson. Our implementation of the lesson embedded the modeling of multiple intelligences theory posited by Gardner (1983; 1998; 1999) via the Artful Learning™ model to demonstrate how an integrated, arts-based approach to instruction provides multiple access points for mastering mathematical content. Prior to this class, students completed the text chapter discussing multiple intelligence theory, and earlier, the chapter on lesson design and instructional strategy choices.

Procedure

We provided a compact version of the Artful Learning™ model (experience, inquire, create, reflect) for Educational Psychology students to promote an arts-integrated experience for the lesson on multiple intelligences. Experience Phase: we developed three inquiry centers, using as the masterwork, *The School of Athens*, by Raphael. The painting merges geometric space with the perfect embodiment of the classical community focus of the High Renaissance. In the process of examining the work, preservice teachers reviewed common geometry vocabulary and set the Masterwork in a historical time period. They also reviewed the multiple intelligences and began planning discussions about applying multiple intelligence theory. Inquire: for homework, teams of students used digital cameras to capture 20 geometric images on campus. Groups printed their photos, writing narrative descriptions about the picture, and identifying the shapes recorded as well as giving a rationale/explanation for the identified geometric vocabulary. Creation Phase: students printed their images of geometry and brought both pictures and narratives to class to create a collage representing geometry in the real world. Reflection and assessment phase: in the final phase of the task, students described their learning in regard to multiple intelligence pedagogy, mastery of content, differentiation of instruction and participatory, arts-based inquiry. We followed up this lesson with a lesson planning quiz to determine whether students applied multiple intelligences theory in their lesson designs. We also included six reflective prompts on instruction to determine how students constructed meaning for how multiple intelligence theory and arts-based integration might affect student learning and their professional teaching practices.

Results and Discussion

We analyzed the two types of assessments, an original lesson plan and six reflective prompt responses to discover student understanding of multiple intelligence theory. The lesson plan assessment required students to “use what you learned about lesson planning, Bloom’s taxonomy, instructional strategies, multiple intelligences, and integrated, arts-based curriculum, to create a lesson plan that aligns with and supports appropriate standards for a class and grade level that you may one day teach.” Students could use both text book and notes to respond, but lesson plans were to be original. We used percentages

to show overall inclusion of the most important identified targets. The six reflective prompts required students to examine their personal experiences with the arts-based lesson format and geometry content, and to analyze their personal experiences and reactions to modeled pedagogy. Student responses to these prompts became the primary focus for our qualitative analysis of the modeled lesson as prompts nudged students to construct meaning for applying pedagogical ideas to their future professional practices:

1. How did your group decide what pictures to take?
2. The best part of the lesson was:
3. The most difficult part of the lesson was:
4. Something that I learned as I was involved with this project was:
5. How might knowledge of multiple intelligence theory and arts integration impact your daily practices? (Consider differentiation and extending student learning as well as your assessment practices in your response.)
6. Explain the relationships present in your original creation. (In your response consider the medium, color, size, geometry and arrangement of shapes.)

Descriptive Analysis

Table 1 details the percentages of responses reported overall and by class to the four scoring criteria. While 51% of students included multiple intelligences in their lesson plans, a marked difference existed between the percentages of students doing so in Section A as compared to Section B. The universal design elements were second to multiple intelligence theory at 43%. Both Section A and Section B students responded similarly, and there was virtually no difference in their ability to include the three universals in their lesson plans.

The inclusion of arts-based strategies ranked third overall with 34% of students referencing them in their plans. Like the multiple intelligence category, there were differences between the two sections in use of arts-based strategies, with 44% in Section A, and 31% in Section B.

The final category, designing accommodations, was, at 29% the lowest ranking category. Response rates differed between the two sections, with 38 % of Section A students identifying appropriate accommodations strategies, in contrast to 21% of students in Section B. We noted that students in Section A outperformed students in section B on all four measures, most notably by including appropriate multiple intelligences and accommodations in their lesson plans.

Category	Overall % n=35	Section A % n=16	Section B % n=19
Multiple intelligences	51%	69%	37%
Universal design	43%	44%	42%
Arts-based strategies	34%	44%	31%
Accommodations	29%	38%	21%

Table 1 Summary (percentage) of responses to coded categories overall and by class section

Qualitative Analysis

We used a content analysis process recommended by Patton (1990) to determine patterns and themes in the qualitative data. His method for content analysis suggests that the primary patterns are revealed through the process of identifying, coding, and categorizing the data. In order to reveal the primary patterns present in the students' responses, the three researchers each read every lesson plan, noting data that seemed to indicate ways in which multiple intelligence theory could be accurately represented. Then the researchers met as group, comparing their coded responses to determine the

representative categories for coding responses. Four categories emerged as benchmarks for identifying how multiple intelligences might be considered:

1. *Universal design elements* for content accessibility, including multiple means of representing content, multiple ways of representing content, and multiple ways for assessing content in the lesson plan;
2. Applying *multiple intelligence* theory correctly in the lesson plan by including participatory, multifaceted teaching methods, rather than, or in addition to, direct or expository instructional choices;
3. Incorporating or analyzing how *arts-based skills and strategies* provide multiple entry points to the content in either the lesson plan or the reflective prompt, and, designing;
4. *Accommodations* for special needs students that include the recognition of a variety of strength areas for accessing content.

To determine what meaning students constructed regarding the usefulness of multiple intelligence theory and arts-based integration for impacting student learning and their future professional teaching practices, we examined their narrative responses to our modeled multiple intelligence exploration lesson. Most students could articulate (albeit in varying degrees) that they saw the application of arts-based integration for exploring content and enhancing student learning of content:

One major way in which it changed my thought process on education would be in that originally, I've often thought of going to the higher levels of Bloom's Taxonomy to be solely a way to better student's ability to complete lower level tasks: however, upon doing these activities I've come to realize that teaching towards the end of creation [original creation phase of the LBC model] and attempting to make interdisciplinary connections cannot simply be thought of as ways in which students can understand how knowledge does not only have a singular context. This idea based on arts-integration, will be very important to my classroom. I hope to create a classroom where students can express the content through their own lens through more open-ended assessment practices (i.e., essays without pre-assigned topics, fictional stories in which students use what they know, and working together with those from other departments to attempt to create a more unified learning experience (instead of a situation in which each class exists in a vacuum). Multiple intelligence theory will also be an important part of my classroom in that it provides the basis for creating an environment which reaches out to people of many learning styles so that teaching doesn't seem to be simply designed for logical thinkers or those with linguistic intelligence....I might provide metaphorical objects for different historical events and people so as to reach those with spatial intelligence or have the students listen to music to get a feel for a certain zeitgeist during a historical period.

I think that my new knowledge of multiple intelligence theory and arts integration could impact my daily practices. Integrating arts into lesson is something that I never really thought about doing before, because it is not something that I've ever really done. However, I think that it could be a great thing because some students may learn better using this method. For example, many teachers do things like lecture their students and assign readings which are great ways for students to learn. However, using the multiple intelligence theory and the idea of arts integration can be better for extending student learning because it may allow certain students to further understand the concept.

The knowledge of multiple intelligence theory has already affected the way I write lessons. My original idea for a lesson changed drastically after going through the

[multiple intelligences] lesson. The lesson challenged me in ways that I've never been challenged in the classroom...

We noted that our preservice teachers also began to consider how instructional design targeting areas of student strength could be instrumental in making curriculum accessible to a variety of diverse learners:

It is very important to present your information in a few different ways to accommodate for the varying intelligence types that you will have in a classroom. We learned this most clearly through one of the individuals we had as a group [inquiry center task]; we had to teach him a concept using a variety of intelligences. This was no easy task...it is important not to always give the same type of assessment. Our assessment [original creation] was a creative project, which allowed us to show what we learned in a creative format without having to fear if we had the right answer. There was no [single] right answer, but many different ways to show that you understood the concept.

In considering multiple intelligences, arts-integration methods can be used to reach many students. Although it may be impossible to connect to every student's specific needs...it is helpful to vary instructional methods so that many students can have entry points into understanding the content. Therefore, daily instructional practices will include various methods of presenting content such as listening to a lecture, reading individually, discussing in groups, getting up [moving] in an active game, or creating an original project. Learning through the arts extends student learning by integrating multiple subject areas (interdisciplinary studies) and having them [students] think outside the box.

It is important to vary teaching practices to reach every student as well as not bore all the students. Also, it's important to integrate multiple intelligence in assessment because students may actually know the material but not be able to present it in the way [format] in which it is asked [framed]. By including a variety of assessments it allows the teacher to know whether or not all students understand.

Our students also began to consider their personal educational experiences through a new lens, specifically connecting instruction with achievement in the content area. It was exciting for the faculty to see that students understood that assessment and instruction were inextricably connected, and that the accommodation of diverse learners is aided by multiple ways of conceiving assessment practice:

As a teacher, it would give me an opportunity to present the content in a different way, which is hard as a math teacher. As a student, multiple intelligence theory and arts integration would give me an opportunity to be more creative in less interesting subjects, and it would help me learn about a subject area differently so that I may understand it better.

I think multiple intelligence theory and arts integration are probably very helpful in extending student learning. With assignments such as the one we did in class, it is basically impossible to not touch on a student's strong point in [for] absorbing information. .. My partner and I had to plan what we would contrast in our art work and how we would accomplish this. Kinesthetically, we walked around, chose what picture to take, and actively placed them [photos of geometry] in their appropriate places on our finished piece of art. Visually, we had to pay attention to what we were taking pictures of and how we were laying out our final piece of art. This activity made me a little more

open minded as far as assessment practices are concerned. I suppose that in many cases, a student could demonstrate knowledge of the subject matter to me just as effectively by means of art as through an essay or short answer test.

Multiple intelligences are something that one does not see until they are pointed out, but once it has been, one can see it everywhere. I see now that may be impacting me now in each one of my classes, I think about what the teacher is doing and how she is teaching. I sometimes find myself picking out what intelligences he/she is using and thinking about what they could have done better to incorporate more people...

Examining these responses revealed that students changed their mindset regarding content presentation, instructional strategy variety, and assessment practices. Clearly, many students had not experienced arts-based integration or lessons using a multiple intelligence approach. It is not surprising that teacher candidates in the early phases of teacher preparation are able to verbalize some understanding of multiple intelligence theory and arts-based integration strategies; however, they struggle with translating theory into instructional practice as evidenced by their partially successful integration of multiple intelligences lesson plan designs (51%). Our experience in introducing new theoretical ideas suggests the need to spiral multiple intelligences and differentiation concepts during the semester and throughout several classes during the program. We also strongly believe that preservice teachers must witness field mentors modeling and effectively implementing these strategies during their field experiences as well as to reinforce campus instruction.

These student responses also reveal that our sample of preservice teachers is still developing and quite variable in their ability to be critically reflective. As these preservice teachers are now beginning their second class in the education program, we know that students have been exposed to critical reflection, and that they have had opportunities to practice reflective thinking. However, clearly, more practice opportunities are needed. While some students specifically identified how they might use multiple intelligence theory in their classrooms, the majority of students did not explain or identify a pedagogical context for applying multiple intelligences nor discuss the moral and ethical implications associated with making an instructional choice. This project was implemented around the midterm of the semester, and the timing served as a formative assessment check for reflective thinking skills. We noted that more guided practice opportunities for developing reflection needs to be included throughout the remainder of the semester.

In our interpretation of the differing success rate for implementing multiple intelligences theory between the two class sections (Section A, 69%, versus Section B, 37%), we identified one possible explanation for Section B's lower scores attributed to history as an internal validity threat. During the second day of instruction, as we began the inquiry center activities on multiple intelligence theory in Section B, we lost approximately 15 minutes of class time because of a fire drill. Fifteen minutes, while seemingly insignificant, is 20% of the class period. This random disruption shortened practice time within the lesson and may have significantly reduced students' ability to apply multiple intelligences concepts on their lesson plans.

With the exception of one individual, every student in our study reported that they were motivated and engaged to learn about the multiple intelligences through the arts-based format of this lesson. This finding held true for students, including several who qualified their response by indicating that they were "not math persons" and had little interest in geometry in particular. We feel that this affirming student response to the lesson was an important endorsement for our intentions—to set the conditions for preservice teachers to construct meaning about the usefulness of multiple intelligence theory for exploring academic content areas. Student comments to the best part of this lesson prompt clearly identified increased motivation for those students who did not enjoy mathematics:

I would say the best part was being able to connect these seemingly disparate ways of learning in a way which had meaning to me. I personally never really cared for math, for

instance, and in learning it through more visual and kinesthetic ways, I was able to comprehend geometry in new and interesting contexts.

Personally, I enjoyed the exercise we did where we used multiple entry points of the multiple intelligences to explain a topic. I found that to be quite fun; trying to think up different and entertaining ways to explain a concept through means of a different concept such as math through music. Maybe I would understand math better, if I would have been taught it through a different means.

The best part of this lesson was learning about learning in new, creative ways. It made me want to participate, and put a new twist on a “boring” subject such as geometry. Despite the fact that I am not really interested in the arts, the lesson still got me involved and I can honestly say that I learned something about the School of Athens and the geometry involved in making it.

Our data indicates that as a result of this project, our preservice teachers began to consider the value and need for fostering engagement and insights about how to make content accessible and relevant to learners:

The best part of this lesson was seeing first-hand how multiple intelligences really work by doing the math worksheets with pictures and definitions. It was really interesting to see how parts were difficult [written definitions of geometry terms] and easy [pictures of geometric terms] for different people.

Even more, I was able to see geometry’s application in everyday life (occurring in nature).

The best part of the lesson was recognizing how much geometry is involved in our everyday lives. Prior to this lesson, I did not notice how geometrical shapes make up so many structures and even natural objects. When we were walking around campus looking for geometrical objects, it was surprisingly easy because they were all around us. I thought it was amazing how much naturally-occurring geometry we found, too.

We knew from our experiences with the Artful Learning™ model that the original creation phase of the model fostered creative exploration of lesson concepts, and we were eager to see how our preservice college students responded to it. While some students did not specifically mention the original creation in their responses, a few students specifically commented on the opportunity to use art materials to provide an original visual representation of their learning. Many of the original creations were detailed and quite clever, reinforcing for us (as faculty), the importance of creating opportunity for novel and original work:

I really liked how it all came together in the end, and we got to make our original creation. It made me excited about learning geometry, and it was really neat to learn about geometry with such a unique method.

The best part was feeling like a kid again. I never would have expected to use markers, glue, fabric and Popsicle sticks in a college class. It was wonderful to have artistic freedom to explore a concept, and fascinating how all the pieces of the puzzle fit together perfectly.

The best part of this lesson was being able to participate in so many hands-on activities. It’s been quite a long time since I was able to do an art project in class and actually learn

something. I was really able to see how students can learn through art. Being a math major, we rarely get to see how math is observable in the real world (surprisingly!). It was really interesting to see how students can learn math, which is usually considered to be such a rigid and straightforward subject, through such an activity. I definitely liked the fact that people who are not math-oriented can enjoy such an activity and see the connection between math and art.

Student comments reflected an overwhelmingly positive response to the learning activities across a wide range of learners in various disciplines. Because observation is part of the skill being developed in this lesson, it was interesting to see that many students began paying attention to previously unnoticed geometrical features of the campus. The lesson's inclusion of an original, creative activity in relationship to exploration of a concept appealed to students. Many commented on how the modeled lesson provided alternative opportunities for communicating understanding and thereby demonstrated one of the universal design elements targeted for the lesson. And while students viewed the original construction as a challenge, they appreciated the opportunity for creativity and originality.

Conclusions

Our action research study surrounding multiple intelligence theory in lesson design brought several important themes to light. It reinforced for us the challenges associated with creating ongoing opportunities and experiences to model best practices for impacting student learning. Our lesson centered on only two 75 minute class periods, or one week of instructional time. Perhaps the multiple intelligence lessons did not affect greater application for student-developed lesson plans, because instruction was constrained by time. During the course of the semester and over time, as students experience more opportunities for creating original work, we may see additional evidence for applying multiple intelligence theory to lesson design.

We consider this study a preliminary attempt to explore how arts-based strategies may be implemented in undergraduate teacher education curriculum, particularly to demonstrate students' conceptions of content and instructional delivery. Our results suggest that students are interested and do respond to teaching and learning through integrated arts-based strategies. However, more research should be done with larger samples and longer data collection periods to establish the strength of these connections for attaining mastery of content. Future investigations might include changes to the timing of when students are asked to complete the six reflective prompts, which would change the way students target multiple intelligences and arts integration into their lesson plans. Additional methodological adjustments might include providing students with best-work examples before they begin the reflection and lesson planning process. Scoring student reflections for productivity (Dittrich, Pool, Stebick & Weigler, 2008) could yield insights into the relationship between high-level reflective thinking and effective lesson planning. Perhaps more preliminary practice with critical reflection would help students make more meaningful connections to professional practice decisions. Our study also provides some support for modeling the kinds of lessons in college classrooms that increase student awareness of the artistry associated with pedagogical choices, which include the arts as a vehicle for exploring content. Students noted that the use of the arts provoked their thinking on the concept of geometry, lending some credence to Bernstein's belief that the best way to know a thing is in the context of another discipline. Our data provides some preliminary evidence to show that using arts-based instruction in a preservice teacher program has promise for fostering better pedagogical decisions to benefit learners at every level.

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